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Ministry of Higher Education and
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College of Dentistry

Copy Denture

A project submitted to
the Department of Prosthodontic College of Dentistry, University of Baghdad,in partial fulfillment for the degree of Bachelor in Dental Surgery

By

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Certification of the Supervisor

I certify that this project entitled"Copy Denture" Was prepared by **Ali Mahmood Mustafa** under my supervision at the College of Dentistry/University of Baghdad in partial fulfilment of the graduation requirements for the degree of Bachelor in Dental Surgery.

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Dedication

I humbly dedicate this piece of work to the ones who've always been there for me and gave me love and inspiration along my studying currier.

To my beloved parents.

To my brothers and my sister

To my supportive cousin, Dr. Afaf.

To my supportive friends.

Acknowledgment

First of all, I thank **Allah Almighty**, who has blessed me with wisdom, patience, and willpower to reach this level in my life.

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INTRODUCTION

The duplicating procedure copies most of the features of existing denture. The contour of the original denture preserves the neuromuscular condition of the patient. It is most appropriate when a patient is satisfied with his or her existing dentures but requires a new denture as a backup. This may arise if the denture is broken, lost, or need to be repaired. It also saves the hassle of going through all the steps of denture fabrication. It preserves the function and esthetics without the need to adjust to a new set of dentures. Patients with medical conditions like gastroesophageal reflux disorder experience denture teeth attrition. In such a scenario, the intaglio surface of the denture is usually intact but there is loss of vertical dimension **(Driscoll, 2008).**

The treatment of patients who need complete dentures, challenges the skills of a dentist. 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 **(Ender, 2018).**The increased life expectancy of the elderly edentulous population augments the challenge of restoring mastication, phonetics and esthetics for these patients. Dis-satisfaction with complete dentures is a common phenomenon adaptation to replacement dentures is a continuous struggle for the elderly especially, when major changes are made on the occlusal and fitting denture surfaces. The patients which pose the greatest threat are the ones with systemic disorders such as Parkinson's, dementia and physically frail **(Ferencz, 2018).**

A clinician must appreciate that the degree of adaptive capability of old denture wearers is also related to the health of the supporting tissues, their neuromuscular coordination, and their motivation for learning new skills **(Hasan, 2018).**Patient with old and in-adequate prosthesis are still able to persevere with them due to muscular control developed over a long period. However, a new prosthesis requires the development of a new learning sequence and the will to be persistent. 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 **(Santos 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 minimum 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. Since the desirability of copying was recognized by Fenn et al in 1953, several methods have been evolved, most of which are based upon the production of replica dentures from impressions of the existing appliances to form the basis of the new appliances **(Park et al, 2019).**

Aim of the review

1. The transfer of contours from old to new dentures for maintenance of neuromuscular control.
2. Any modifications done to the basic shape of the old denture should therefore be only those necessary to correct the loss of fit i.e., (patient's complaint) and those considered essential by the operator, e.g., slight increase in the OVD and the replacement of the worn denture teeth.

Chapter one: Review of literature

1. Definition:-

In prosthodontics, the copy technique (or copy dentures) refers to duplica tion 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. A copy denture preserves the polished surface of the existing prosthesis while allowing modifications to be carried out to the fitting and occlusal surfaces of a complete denture. As a patient's adaptive potential decreases with age the maintenance of the shape of the original polished surface results in less adjustment of the supporting musculature being required. Therefore the title 'Copy denture technique' is really a misnomer as it is only rarely that an exact copy of an existing denture will be required **(Filius et al. 2020).**

2.Indications

1. Request for duplicate or spare.
2. Satisfactory of position of teeth in the neutral zone and good polished surface.
3. Loss of retention in favourable denture that require replacement due to bone resorption.
4. Elderly patient neuromuscular control require longer time.
5. Wear of the occlusal surfaces.
6. Replacement of immediate dentures **(Al-Rawi et al. 2020)**

3.Contraindications

1. When the patient dislikes the appearance of his/her current dentures.
2. When there is denture instability due to incorrect setting of teeth.
3. When the status of the underlying tissues merits one of the special Impression techniques. Ex: flabby ridge **(Yang et al.2021)**

4.Historical Background:

1- replicating the shape and contour of existing dentures recognized since 1950s.

2- Liddelow, in 1964: As patients age reduction in their ability to lean new muscle activity patterns (conditioned reflexes) needed to adapt to a new denture shape.

3- Brill, in 1967: Importance of neuro-muscular control good denture stability & recommended replacement dentures.

4-Hoad-reddick et al: Replaced after every 5-10 years reduce problems in adaptation to new dentures **(Kinsel et al.2022).**

5.Advantages of copy dentures:

1. Less clinical and laboratory stages than normal method of making new dentures.
2. Less work for dental technician.
3. Can make copy dentures (usually) without damaging the old ones, and without needing to take the dentures away from the patient between appointments, which may be socially awkward for them.

4. 4. Enables the reproduction of successful design features which have determined the patient's tolerance and control of previous dentures.
5. Allows the accurate correction of the un-desirable features of previous dentures.
6. Provides a simplified occlusal registration technique.
7. Requires a reduced number of clinical visits to the dental surgery. **(Papaspyridakos et al, 2008)**

6.Disadvantages

1. Major mistake of the old denture is difficult to overcome with this techniques.
2. Clinician and technician may not familiar with this technique.
3. Not all patient suitable for this denture construction.
4. Crucial assessment of existing denture. **(Tan et al.2008)**

7.Possible causes and advantages of duplication

Certain circumstances occur in which the duplication of complete denture provides valuable services to the patient **(Sailer et al, 2007).**

1- May be needed by patients who are having their dentures relined or rebased and they can't withstand the embarrassment of being without dentures even for a short period of time.

2- Or by patient who wishes to have another set of denture as a spare denture in case the original one are lost or broken.

3- Also denture duplication is indicated in elderly patients, patient with old, worn, or loose dentures which were otherwise successful.

4- The patient who is extremely satisfied with an esthetic result and wishes to re produced in a new denture.

5- When the dentist is difficult to be reached or its difficult for the patient to do a new denture because of extra clinical visits.

6- Poor patient cooperation, eg., Alzheimer, Parkinson's or dementia, as the duplicate denture enhance the neuromuscular adaptation to new denture as they are basically of similar shape and form to the original one.

7- Include less clinical steps, simple registration of jaw relation, and it gives the technician a guide to teeth position and moulds.

(Sailer et al, 2007).

8.Materials used for copy denture (Al-Amleh et al, 2007)

1. Alginate + soapbox.
2. Alginate + metal impression tray.
3. Silicon putty + soapbox.
4. Silicon putty + plastic impression tray.

9.Materials for the replica (Katsoulis et al, 2010)

1. Cold-cure acrylic.
2. Melted modeling wax.

10.Dimensional accuracy of duplicate denture

Making denture by duplicating technique, the dimentional accuracy of the replica is of a most importance.Therefore, The different methods of duplicating dentures usually include the use of different material such as acrylic resin heat or cold cure for denture base and teeth, wax, plaster and stone, reversible or irreversible hydrocolloid mould material and silicon mould material; all these materials gives rise to certain amount of

dimensional changes, which is very important in the evaluation of the accuracy of duplicate denture.Many methods of duplication were described over the last seventy years, some of these methods require no clinical visits, where they described as quick and inexpensive method, while others require clinical visits for improving the retention and stability with wash impression and/or recording jaw relation and trying the dentures in the mouth.Late (2000s)… CAD/ CAM System applied to prosthetic dentistry by 3D imaging technique for more precise, time, effort, saving for both patient and operators **(Misch et al.2008).**

11.When to Duplicate a Denture?

• We are not going to duplicate a denture unless its examination reveals satisfactory findings as regards to esthetic, physiologic, and psychologic needs of a patient.

• The denture(s) should be evaluated for any previous fractures, craze lines, missing or replaced teeth, esthetics, phonetics, accuracy of fit, and vertical and centric relations.

• On the basis of this examination, the patient is then advised whether the existing denture should be duplicated or re-made. **(Brägger et al.2009)**

12.Temporary Duplicate Dentures

Production of temporary duplicate dentures is sometimes carried out with the aim that these can be progressively modified if the patient's capacity to adapt is in doubt (e.g., gradual increase in occlusal vertical dimension) or if the cause of the patient's complaints is not clear (e.g., patient may be a denture collector). These could be fabricated with low cost and with less

clinical and laboratory time. Once a satisfactory appliance has been achieved, it can then be copied to produce a definitive denture **(Shibli et al.2009)**

13.Techniques for Denture Duplication

A number of methods or techniques have been reported for producing a template for a duplicate or copy denture. All these techniques are similar except in the use of mould container and materials**.(Lin et al.2020)**

Some of these methods are,

1- Stock tray method

2- Duplicating flask method

3- Soap container method

4- Agar-agar method

5-Modified flask method

6- Pour resin method

7- Cup flask method

8-Duplication Method Using "Appropriatech"

9-"zipper" technique for duplicating denture

10- MediMatch Copy Denture Protocol

11- 3D Scaning

Basically, a mould of the old denture is produced in an elastic material, such as alginate or silicon putty supported in a rigid container **(Lin et al, 2020).**The wax or auto-polymerizing resin template is fabricated from this mould. Any necessary modifications to the old denture are performed on this template denture and tried – in the patient's mouth before finishing the prosthesis.In some of the techniques, auto-polymerizing resin teeth are also

fabricated instead of using available ready-made mould, especially for the temporary duplicate dentures **(Ghahramanloo et al, 2022).**

The general procedure for duplication has been described by Chestnutt and Gibson in 1998 as follow;-

1. Modification of an existing denture, eg., under extension of lingual pouches modified by tracing stick to lower denture.

2. In the laboratory putty moulds are poured into copy dentures with their wax, sometimes with shellac base plates, or pour cure acrylic.

3. Set up, trial of teeth, and insertion; as for conventional complete denture **(S. and Cheng, 2014).**

14.1. Stock tray technique:-

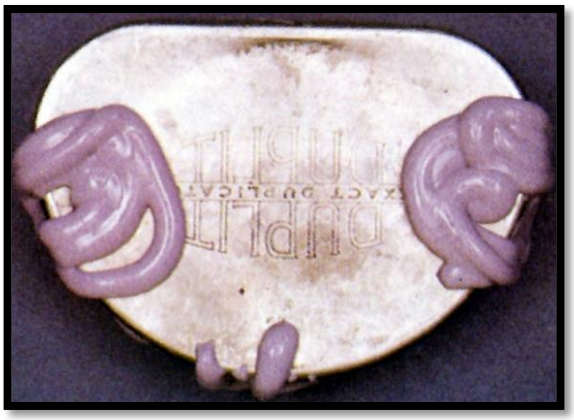
Upper and Lower denture embedded in alginate. The two stock trays with the dentures inside the alginate.The lower denture has been removed from the alginate. The wax has been poured into the impressions of the teeth of both upper and lower. The special tray material has been added and cured.Then articulation with record to be done. Teeth to be replaced by acrylic teeth and to proceed with denture try-in **(Mehl et al.2011)** As shown in figure(1-1).

Figure(1-1)Stock tray technique.*(Mehl et al.2011)*

14.2. Denture Duplication with duplicating flask

This method explain in figures below from(a-i)

Figure(1-2a,b) The denture is submerged in alginate. When the alginate is set, any flash of the material on the base is trimmed with a sharp knife.



Figure(1-2c) The flask is then filled with a new mix of alginate - avoiding any air entr-apment, and the lid is closed.

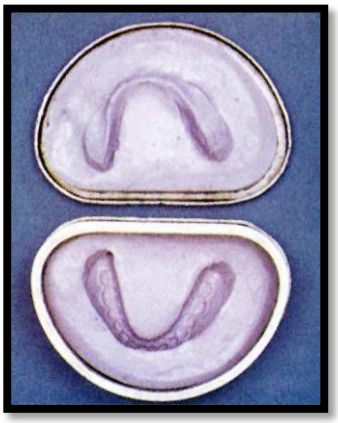


Figure (1-2d) Alginate halves are separated and the denture is removed. It is returned to the patient.

Figure (1-2e) Sprue holes are then cut into the posterior border of the alginate mold.

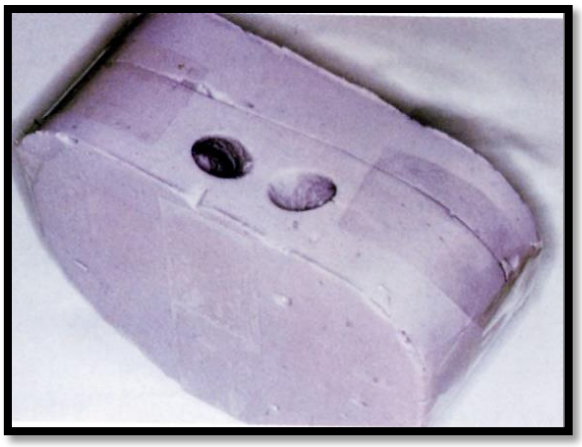


Figure (1-2f) The impression is reassembled and held together with adhesive Tape. Auto-polymerizing resin is then run into one of the sprue holes until it rises from the other.

Figure (1-2g) Lastly, the duplicate monochrome denture is removed from the flask and mounted on a suitable articulator.Then the pink colored teeth are Replaced by the selected mold of the teeth.

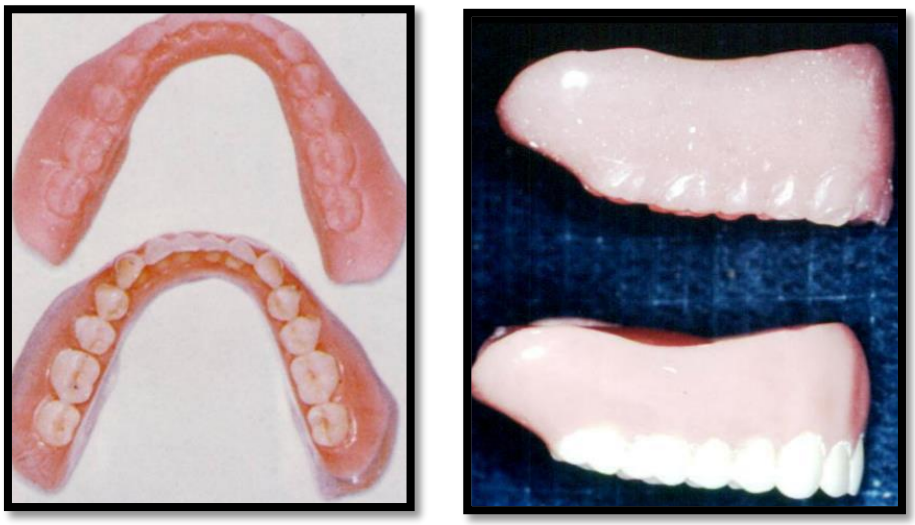


Figure (1-2h,i) Original and Auto-polymerizing resin Upper & Lower template Dentures. **(Rosentritt et al.2009)**

14.3. The Soap Container

This technique explain in figures below from (a-t)

Figure (1-3a) Soap container

Figure (1-3b) Denture borders are modified with green stick compound.

Figure (1-3c) It is then submerged in alginate in the soap container.

Figure (1-3d) Denture invested in the lower part of the container.

Figure (1-3e) Second pour of alginate to complete the investment procedurethe soap container should be pressed from the sides to avoid its distortion.

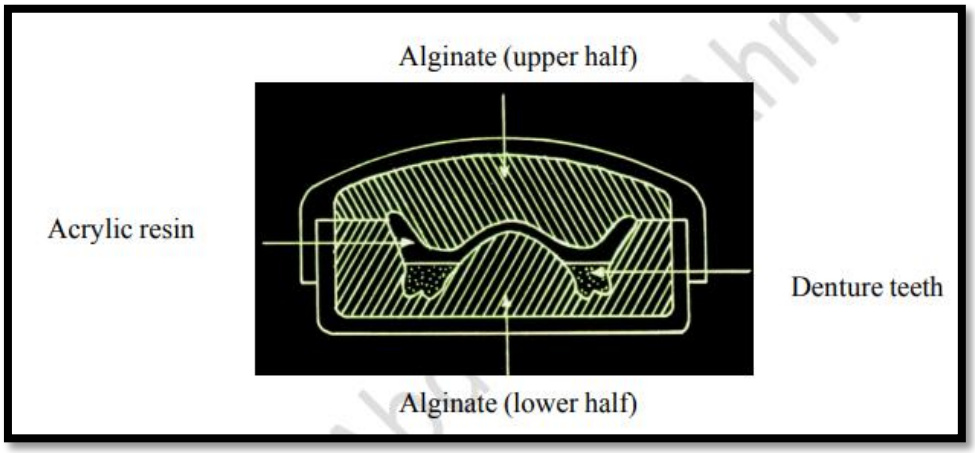


Figure (1-3f) Line drawing showing the mould components

Figure (1-3g,h) Two halves are then opened and the sprue holes are cut wi th a Sharp knife. The halves are then re-assembled and can be held togeth er with elastic bands.

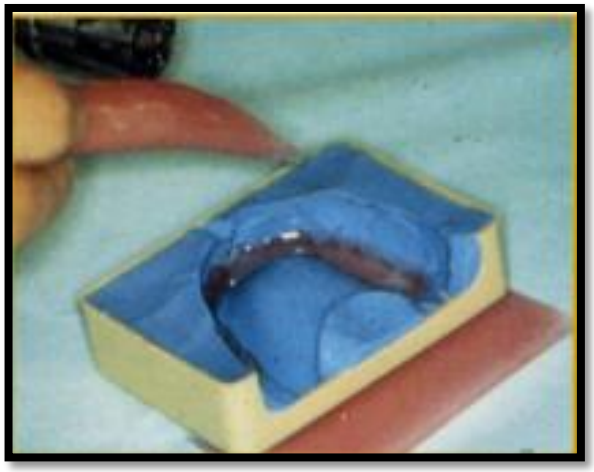


Figure (1-3i) Replication of teeth in Wax.

Figure (1-3j) Wax horse shoe representing the teeth.

Figure (1-3k) Two halves together – 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 cont ain water at 110˚F and process the resin under 15- 30 psi pressure for 30 minutes.

Figure (1-3,m,n,p) The Waxed or Auto-polymerized duplicate dentures are then recovered from the molds.

Figure(1-3r) Upper and lower Templates with waxed teeth and self-cured acrylic resin bases.

Figure (1-3s) Centric relation record is obtained after adjusting the waxed teeth for the OVD.

Figure (1-3t) The wax teeth on one of the dentures are replaced with the identical mould of the resin teeth. The opposing denture guides then set up in identical position to the original denture. **(Bergamo et al.2018)**

14.4. Agar – Agar method

The method explain in figures below(a-f)

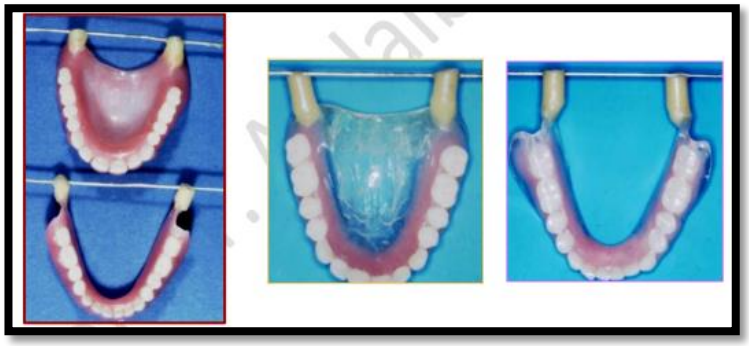


Figure (1-4a) Dentures are suspended with a metal rod through the sticky wax sprues.

Figure (1-4b) Both Dentures are suspended in the agar container.

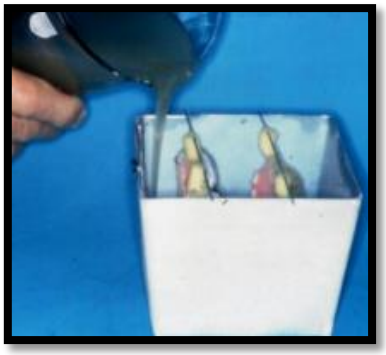


Figure (1-4c) Molten Agar is poured in the container.

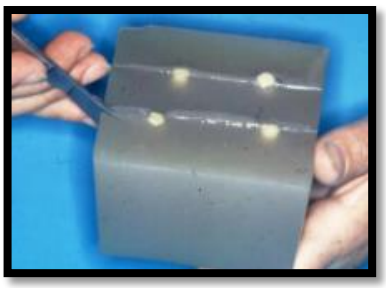


Figure (1-4d) Once Agar is set, the mold is sectioned through the sprue holes to retrieve the dentures.

Figure (1-4e) The mold space after removal of the denture.

Figure (1-4f) Auto-polymerized acrylic resin is then poured in the mold space to produce template dentures for modifications**.(Pjetursson et al.2008)**

14.5. Modified flask method

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 auto polymerizing resin and the flask was closed and held under pressure until the resin set.
The duplicate denture was removed, trimmed and polished.

Modify the denture flask to allow access for the sprue. Roll utility wax to form a sprue. Attach the sprue to lingual surface of the heels of mandibular denture and to the tuberosity of maxillary denture **(Jung et al.2008)**. As listed in figures below (a-c).

Figure (1-5a-c) Modified flask method**(Jung et al.2008)**

- Adhesive is applied to the round plate of the flask and to the interior surface of the flask to facilitate retention of alginate. Mix the alginate and place in the interior of the denture.fil the denture completely. Place the remaining alginate in the lower part of the flask.

- Settle the filled denture into the mix. The wax sprues support denture preventing it from sinking into the alginate. After setting trim away excess alginate. Place upper part of flask in position and adopt the wax sprues to seal the rectangular opening.

- after alginate has set open the flask and remove the denture and sprues. A mould of denture will be formed in the lower cast Dry the tooth indentation in the alginate using air streams. Place the resin into the tooth indentation by sprinkle on technique.

- Add tooth color resin in increments and fill the indentation to the cervical line. Allow it to set for few minutes. Dry the alginate in lower flask, assemble the flask halves and secure them with rubber bands. Mix resin and pour it into one sprue.

- Fill one sprue until resin fills the other. Attach modeling clay to the filled flask, place sprues upward in warm water in pressure containr and cure the denture for 30 min. Remove the denture and examine f or voids etc cut off the sprue and finish and polish the denture **(Jun g et al.2008)**.

14.6. Pour resin method

Boos and Carpenter designed a special flask to be used with reversible hydrocolloid for making the mold. Tooth shade-auto polymerizing resin was painted into the tooth indentations with a brush and pour type of auto polymerizing 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. **(Naert et al.2012)** as listed in figure below

Figure (1-6) Pour resin method**(Naert et al.2012)**

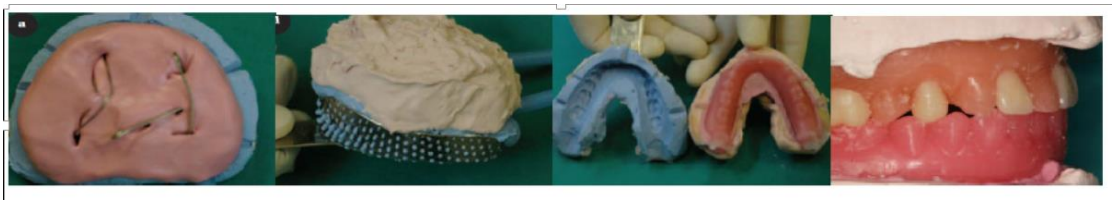
14.7. Cup flask method

has described a method of duplicating complete dentures by using reversible or irreversible hydrocolloid and a cup as a flask. has modified the method by introducing a particularly convenient zipper technique that uses dental floss to section an alginate irreversible hydrocolloid mold pou red in a 12-ounce ceramic cup. Pour type of resin and tooth colored auto-polymerizing resins were used to fabricate the duplicate dentures **(Joksta d et al.2003).** As listed in figure below(a-d)

Figure (1-7a-d) Cup flask method**(Jokstad et al.2003)**

14.8. Duplication Method Using "Appropriatech"

- **Advantages:-** Less chair side time, cost effective and appropriate.
- **Disadvantage:-** The final impressions are the weakest point in the Technique, the vertical and horizontal jaw relationships are at risk, and it is generally un-satisfactory to make final impressions in a trial denture, as the wax may become distorted **(Wittneben et al.2014).** As listed in figures below(a-d)



Figure(1-8a-d) Duplication Method Using "Appropriatech"**(Wittneben et al.2014)**

14.9."zipper" technique for duplicating denture

- Dentures suspended in a cup by means of a crosspiece attached to the sprues.
- Pour enough hydrocolloid into the cup to cover the denture. - Knife cut through the hydrocolloid to the denture flanges will allow the

hydrocolloid mold to be separated.

- Remove the denture and the sprues from the mold. Pour a thin mix of cold-curing acrylic resin tray material into one of the sprue hole
- Prepare the duplicate denture **(Atieh et al, 2013)** As listed in figures below(a-d).

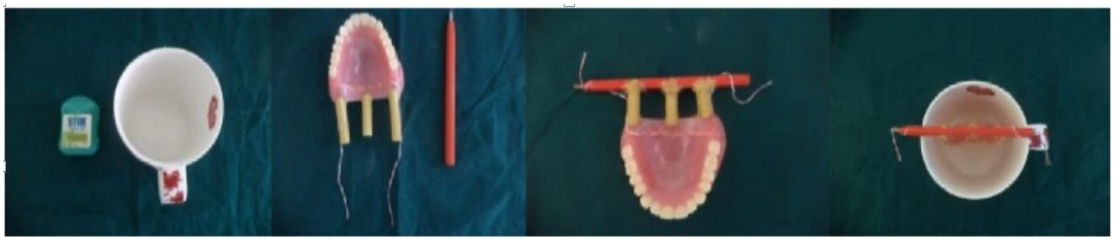


Figure (1-9 a-d) "zipper" technique for duplicating denture(Atieh et al, 2013)

14.10. MediMatch Copy Denture Protocol

The following suggested copy denture protocol is not intended to be prescriptive – it is recognised that there are several alternative techniques available for use by clinicians, but observing the steps below will ensure that MediMatch produces copy dentures of consistently high quality, and will significantly reduce the potential for remakes. As listed in figures(1-11a-f)

STEP 1

Select a disposable impression tray which easily accommodates both the denture and the duplicating putty.

Figure(1-10a)Step 1 of MediMatch Copy Denture Protocol

STEP 2

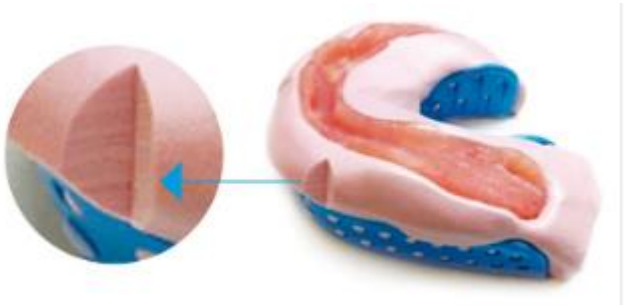
Mix the duplicating putty, place it in the tray, and then push the denture into the putty, with the denture's fitting surface uppermost.

Figure(1-10b)Step 2 of MediMatch Copy Denture Protocol

- Avoid contact between the denture and the tray and make sure that the putty is moulded to reach the full depth of the periphery of the denture.

STEP 3

Mix the Once the putty is set, cut two or three locating notches (to ensure that MediMatch can locate the two parts of the impression mould accurately). Then apply a thin layer of separating medium such as VaselineTM or Baby oil to the cured putty surface.



Figure(1-10c)Step 3 of MediMatch Copy Denture Protocol

STEP 4

- Mix enough putty to form a good base for the mould;
- Push a small amount of the mixed putty onto the fitting surface of the denture to prevent voids forming between the denture and impression material.
- Place the remaining putty on a hard flat surface and press the denture into it, engaging the V-shape cuts created at step 3

Always ensure that sufficient putty is used to create a substantial mould base, to prevent potential distortion during processing in the laboratory.

STEP 5

When the two halves of the mould have set completely, separate them, and carefully remove the denture Record the required tooth shade on the MediMatch Laboratory Form.

Figure(1-10d)Step 5 of MediMatch Copy Denture Protocol

STEP 6

- Trim any excess putty from the mould periphery.
- Inspect the mould carefully, ensuring that there are no air bubbles or voids, and that the impression has faithfully reproduced all features of the denture.
- Ensure that both parts of the mould locate accurately together, in one position only.

STEP 7

- Place both halves of the mould in a disinfection* bath for the time specified in the manufacturer's instructions.
- Remove the moulds from the decontamination bath, rinse under running water, and then seal in a grip seal bag.
- Label the grip-seal bag with details of the patient and method of de-contamination.
- Complete the MediMatch Laboratory Form fully, and arrange for dispatch to MediMatch as soon as posible.

STEP 8

MediMatch will now create a wax copy of the old denture using the impressions provided by the dental surgery.

The dental surgeon must indicate on the laboratory form if the copy denture is to be constructed entirely in wax or if an acrylic base is required for additional stability. An acrylic base try-in provides a more stable and accurate platform for taking the reline impression.

STEP 9 – <u>Wax (or Acrylic/Wax) Copy Denture Try-In</u>

- Check the bite, OVD and required shade, mould, position and set-up of the teeth.
- Take a reline impression, using an *appropriate impression material, ensuring that the material bonds to the wax copy denture – monophase silicones do not adhere well to wax, it is therefore important to use an appropriate adhesive in all cases.
- For upper and lower complete copy dentures, reline impressions should be taken with the patient in centric occlusion;
- Follow the disinfection procedure detailed at Stage 8, and arrange for shipment to MediMatch as soon as posible.

Figure(1-10e)Step 9 of MediMatch Copy Denture Protocol

STEP 10 – Final Try-In

MediMatch will provide a final set-up, based on the wax copy denture reline impression supplied. Please confirm at this stage that:

- The bite is correct and that the copy denture is stable and retentive.
- Position, mould and shade of the teeth are correct and have patient approval.
- The contour of the polished surface is as required, as this will determine the overall contour of the finished denture.

Follow the disinfection procedure detailed at Stage 8, and arrange for shipment to MediMatch as soon as possible **(Wong Aj, 2020).**

14.11 3D scanning

14.11.1 Development

Conceived and developed in the latter half of the last century **(Khan et al, 2019).** The 'copy denture technique' continues to be advocated and used in current dental practice to provide cost effective replacement dentures. The templates for the copy denture technique have been produced in a number of ways **(Voulgarakis et al.2014).** All these traditional ways of producing the copy denture template involved a physical impression of the denture to produce a mould and a subsequent pouring of a cast or template in wax or acrylic of the patient's denture. Recently, new technology has enabled these templates to be produced by optical scanning of the patient's denture and 3D printing the shape the of original denture**.(Zhang et al.2019)**Three-dimensional (3D) scanning has become an increasingly popular technology in the field of dentistry. One area where it is particularly useful is in the creation of copy dentures. Copy dentures are replicas of existing dentures that are made to fit a patient's mouth perfectly. 3D scanning allows for a more accurate and efficient process of creating copy dentures, leading to better outcomes for patients.**(Mehl et al.2012)** Traditionally, creating a copy denture involved taking a mold of the existing denture using a material such as alginate or silicone. The mold would then be sent to a dental laboratory where a dental technician would use it to create a new denture. This process was often time-consuming and could lead to inaccuracies in the final product. **(Sadid et al, 2020)** As discuss in figure below.

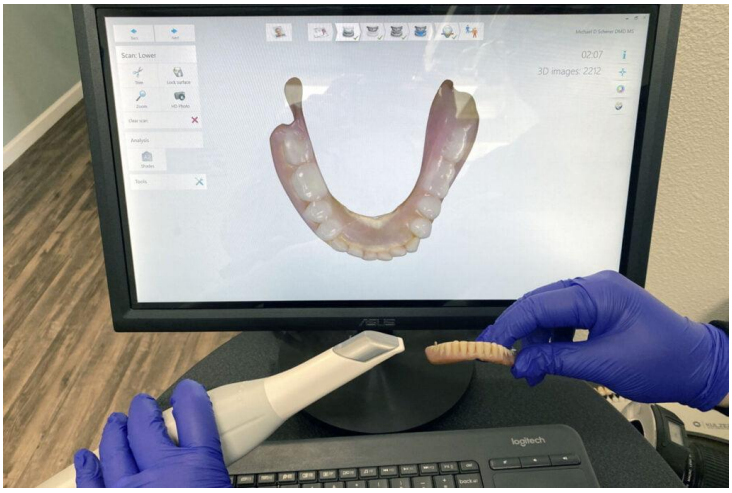


Figure (1-11) scanning for complete denture

(Ferro et al, 2019)

3D scanning has revolutionized this process by allowing for the creation of digital models of the patient's mouth and existing denture. The scanner uses a series of cameras or lasers to capture the shape and contours of the mouth and denture, creating a 3D digital model that can be used to create a copy denture **(Bencharit et al.2020)**

14.11.2 Adavantages of 3D Scanning

One of the primary benefits of 3D printing in dentistry is the increased accuracy it provides. With traditional methods, there is a risk of human error, leading to inaccuracies in the final product. 3D printing eliminates this risk by creating digital models that are then printed with a high level of precision. This accuracy results in better-fitting restorations and ultimately better patient outcomes **(Mericske et al.2008)**

Another significant benefit of 3D printing in dentistry is the speed at which restorations can be created. Traditional methods can be time-consuming and require multiple appointments, causing discomfort and inconvenience for patients. With 3D printing, dental restorations can be created quickly,

often in a single appointment, reducing discomfort and minimizing time away from work or other obligations **(Bell et al.2010).**

Finally, 3D printing offers a more comfortable experience for patients. Traditional methods, such as taking dental impressions, can be uncomfortable and even painful for some patients. 3D printing eliminates the need for these impressions, allowing for a more pleasant experience overall **(Rathi et al.2012)**

14.11.3 Dis-advantages of 3D scanning

While 3D printing has many benefits in dentistry, there are also some disadvantages that should be considered. One of the main disadvantages is the cost of equipment and materials. The initial investment in 3D printing technology can be significant, and ongoing costs for materials and maintenance can add up over time **(Leles et al.2013).**

Another potential disadvantage of 3D printing in dentistry is the quality of the final product. While 3D printing can produce accurate and precise restorations, the quality may not be as high as those created through traditional techniques. This is particularly true for complex restorations, which may require more manual labor and expertise **(Dhir et al.2013).**

In addition to these disadvantages, there are also concerns about the safety of 3D printed dental restorations. Some studies have suggested that 3D printed restorations may not be as biocompatible as those created through traditional techniques. There are also concerns about the potential for contamination during the printing process **(Zou et al.2016).**

14.11.4 COMPARISON TRADITIONAL VS 3D COPY TEMPLATES

The conventional fabrication procedure of duplicating a denture has a series of technical steps: impression, mold made, 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(poly lactic acid) denture using a 3D printer **(Özkan et al.2016)**.3D printed copy denture templates reproduced the original denture with significantly greater trueness and precision, regardless of which error metric was used. The metric of 'maximum surface deviation' may prove to be the most clinically relevant, as previously discussed. This maximum error was significantly lower with 3D printing, than with the traditional copy technique.The error patterns for both 3D and traditional techniques warrant further investigation, in particular to include lower dentures **(Yilmaz et al.2018).**

Conventional VS 3D Scaning technique

The introduction of 3D printing technology has revolutionized many industries, and dentistry is no exception. In recent years, 3D printing has become increasingly popular in dentistry, particularly for the creation of dental restorations such as crowns, bridges, and implants. But how does 3D printing compare to conventional techniques in dentistry?

One of the main advantages of 3D printing is its accuracy (Traditional techniques, such as hand waxing and casting, can result in inaccuracies and inconsistencies in the final product. With 3D printing, digital models of teeth and gums can be created with a high level of precision, resulting in

more accurate restorations**.(Fardal et al.2020).**Another benefit of 3D printing is its efficiency. Conventional techniques can be time-consuming and labor-intensive, requiring multiple steps and a significant amount of manual labor. 3D printing, on the other hand, can streamline the process, reducing the time and labor required to create dental restorations.
(Daas et al.2020) As discuss in figure below

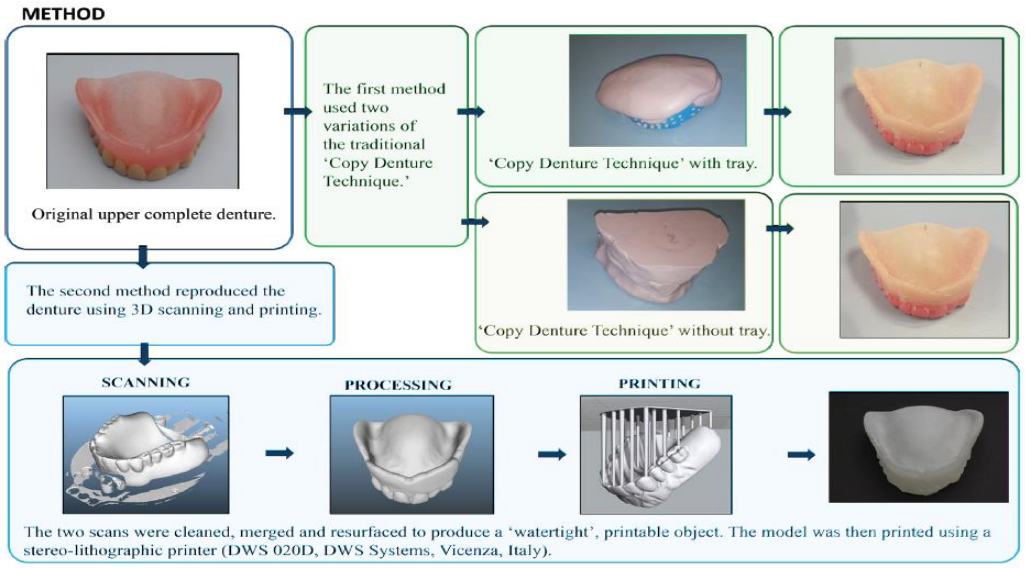


Figure (1-12) duplicate complete denture using 3D printer (El-Anwar et al, 2020)

14.11. Effect of performance

The conventional procedure used to fabricate the duplicate denture needs much human power and uses more quantities of various dental materials while the introduced procedure needs less human power and uses less quantities of one dental material, thus minimizing waste **(Gutiérrez et al.2021).** Although the scanner and printer is expensive, this equipment will eventually get cheaper as they become widely used and as technology advances **(Ahuja et al.2021).** In the conventional procedure, the dental materials used are alginate impression material and the auto-polymerizing

resin while in the introduced procedure, the material used is only the PLA material. The chair-side-treatment time will be about 30 min for the conventional procedure, whereas it will be about 5min for scanning, 5min for 3D reconstruction, 15 min for digital processing, and 4 h for 3D printing for the introduced procedure. In addition, clinicians need to handle various dental materials, which may come into contact with potentially infectious body fluid in the conventional procedure. In the introduced procedure, there is little contact of the existing denture to other materials and equipment, except during its placement on the rotary table **(Sundh et al, 2021)**. The handheld optical scanner and rotary table are easy to operate and the introduced procedure is also applicable in home-visit dental care settings and at disaster areas **(Dillon S, 2019).**

Chapter two: CONCLUSION

1. For elderly and frail patients who have used their old dentures successfully for a significant period of time, provision of replacement complete dentures by copy denture technique is a simple and cost effective procedure. The replacement dentures will have better adaptability with reduced chair-side and laboratory time.

2. It is therefore helpful to reproduce familiar features of a patient's old prosthesis, especially if these have been used successfully for some years.With replacement dentures, copying of suitable features using a copy denture technique is indicated. The existing denture provides superior trays and registration of maxilla-mandibular relations are easy and more predicable in terms of accuracy. With copy dentures information available in the patients existing dentures is used to simplify and quicken the procedure of making new denture.

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