Republic Of Iraq

Ministry Of Higher Education

and Scientific Research

University Of Baghdad

Collage of Dentistry

Impression Techniques for Class I or Semicomplete

A graduation project submitted to the College of Dentistry, the University of Baghdad in partial fulfillment of the requirement for a Bachelor Degree in Dental surgery Of (B.D.S.)

By:

Alaa Abdulsattar Jaseem

Supervised by:

Lect. Dr. Mustafa Mahdi

B.D.S., M.Sc., Ph.D.

April, 2022 A.D.

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

(وَمَنْ يَتَّقِ اللهَ يَجْعَلْ لَهُ مَخْرَجاً * وَيَرْزُقْهُ مِنْ حَيْثُ لاَيَحْتَسِبُ وَمَنْ يَتَوَكَّلْ عَلَى اللهِ فَهُوَ حَسْبُهُ إِنَّ اللهَ بَالِغُ أَمْرِهِ قَدْ جَعَلَ اللهُ لِكُلِّ شَيْءٍ قَدْرا)

صدق الله العلي العظيم

سورة الطلاق (2و3)

Certification of the Supervisor

I certify that this project entitled **‘‘Different Impression Techniques For Cl I or Semicomplete’’** was prepared by the fifth-year student **Alaa Abdulsattar Jassem** under my supervision at the College of Dentistry/University of Baghdad in partial fulfilment of the graduation requirements for the Bachelor Degree in Dentistry.

Supervisor’s name: **Lect. Dr. Mustafa Mahdi**

Date:

Signature:

Dedication

To My God

who continues to give me, please me and guide me

To the Prophet Muhammad And His Chastity Family

Those who taught me the meaning of patience and the importance of knowledge, learning and giving, who instilled in me the love of God and the love of doing good, and the best kind of goodness is giving knowledge and relieving people's pain.

To My Mother

who raised me and taught me the meaning of persistence and to rely on myself who gave me love and stayed up all night to support me in the days of my exams, which without her prayers I would not be here.

To My Dad

who gave me trust, love and a feeling that he is always proud of me and who always encouraged me to be the best version of myself.

To My Brothers, Sister and My Best Friend

who believed in me and trusted my ability to succeed and continued to motivate and support me.

Acknowledgment

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

I would like to thank **Professor Dr. Raghad Al Hashimi,** the dean of the College of the Dentistry, the University of Baghdad for providing me the opportunity to complete my work.

I would like to thank**. Prof. Dr. Abdulbasset Ahmed** chairman of the prosthodontic department for his support.

I would like to extend my deepest respect and gratefulness to **Lect. Dr. Mustafa Mahdi** for his encouragement, meaningful and valuable instructions, and advice throughout working on this project.

In the end, I thank **my family** for all the support they have provided throughout the years of studying, and I would like to thank **my best friends**, for their support and encouragement.

List of Contents

List of Figures

Introduction

Removable Prosthodontics treatment involves the replacement and restoration of teeth by artificial substitutes. The number of adult patients wear removable partial denture (RPD) due to their partially dentate are keep increasing. The treatment is done to avoid rehabilitation. Removable Prosthodontics treatment can offer exceptional satisfaction for both patient and dentist. The trend of the removable partial dentures had changed across the time through evolution of prosthodontics, these changes of trend including the impression techniques used. **(Mohamad et al.,2017).**

Every prosthetic treatment is associated with the placement of a foreign object (the prosthesis) in the mouth of the patient. As a direct consequence of such placement the burden on the tissues in the oral cavity will be increased, for example, plaque more readily accumulates on alloplastic materials than biologic ones. Furthermore, even non-toxic materials will release small amounts of their components into the oral cavity. To justify prosthetic treatment and to ensure that it is beneficial to the patient, the need for such treatment must be established, the patient must be appropriately motivated, and the dentures properly designed, constructed and maintained. **(Davenport et al., 2000).**

Impression procedure forms the basis of a successful Removable Partial Denture however, the construction of a removable partial denture in distal extension cases is a delicate procedure since the prosthesis is supported by two different tissues, namely teeth and mucosa. The different resiliency of these supporting tissues may lead to the instability of the prosthesis. Different techniques have been proposed for the construction of removable partial dentures in distal extension cases where the management of the difference of resiliency in the supporting tissues is an issue. So in distal extension bases the residual ridge must be recorded in functional form and the remaining natural teeth in an anatomic form. **(Muhammad et al.,2012).**

AIMS OF THE REVIEW

The aim of study to review the effects of different final-impression techniques and materials used to make removable partial dentures for Cl I or semicomplete edentulous people , for stability, comfort, and improve quality of the denture.

CHAPTER- ONE
REVIEW OF THE LITERATURE

1.1 Classification Of Partially Edentulous Arches

During the early 1900s, dental practitioners began devising methods for the classification of partially edentulous arches. While numerous classification systems were proposed, some classification systems were overly simplified, while others were immensely complex. It was decided that for a classification system to be acceptable, it should:

1. Allow visualization of the type of partially edentulous arch being considered.

2. Permit differentiation between tooth-supported and tooth-tissue-supported partial dentures.

3. Serve as a guide to the type of design to be used.

4. Be universally accepted. (**VanBlarcom, 1994)**

1.1.1 Kennedy Classification System

The most widely used method for classification of partially edentulous dental arches was proposed by Dr Edward Kennedy in 1925. Although relatively simple, the system can easily be applied to nearly all semi-edentulous conditions. The Kennedy Classification System is composed of four major categories, denoted Class I through Class IV. The numeric sequence of the classification system was based partly on the frequency of occurrence, with Class I arches being most common and Class IV arches least common.

1- Kennedy Class I arch: Characterized by bilateral edentulous areas located posterior to the remaining natural teeth.

2- Kennedy Class II arch: Displays a unilateral edentulous area located posterior to the remaining natural teeth.

3-Kennedy Class III arch: Presents a unilateral edentulous area with natural

teeth both anterior and posterior to it.

4- Kennedy Class IV arch: Displays a single, bilateral edentulous area located anterior to the remaining natural teeth. It is important to note that the edentulous space must cross the dental midline **as shown in figure (1.1).** **(VanBlarcom, 1994)**

1.1.2 Modification Spaces

Each Kennedy classification, except Class I, refers to a single edentulous area. In reality, additional areas of edentulism may occur within a dental arch. Kennedy referred to each additional edentulous area not each additional missing tooth as a modification. Dr Kennedy included the number of modification areas in the classification (e.g., Class I, Modification 1; Class II, Modification 3). **(VanBlarcom, 1994)**

Figure 1.1: Kennedy Classification For Partial Edentouls Arch. (Mccracken et al., 2016).

1.2 Indication of Partial Denture

Removable partial denture: is a denture for a partially edentulous patient who desires to have replacement teeth for functional or aesthetic reasons and who cannot have a bridge any reason, such as a lack of required teeth to serve as support for a bridge or financial limitations. **(GPT9, 2017).**

Indication Of Partial Denture:

1-Long span edentulous area.

2- No abutment tooth posterior to the edentulous space.

3- Reduced periodontal support for remaining teeth.

4- Need for cross-arch stabilization.

5- Excessive bone loss within the residual ridge.

6- Physical or emotional problems exhibited by patients.

7- Immediate need to replace extracted teeth.

8- Esthetics of primary concern, this is particularly true when the practitioner must simulate the appearance of diastemata, dental crowding, dental rotation, or extreme changes in the soft tissue architecture (e.g., recreation of papillae to avoid the appearance of dark interdental spaces). **(Mccracken et al., 2016).**

1.3 Fundamental Design Considerations

Any discussion of removable partial denture design should be preceded by a basic understanding of oral biomechanics. Support for removable partial dentures may be derived from the remaining teeth, the hard and soft tissues of the residual ridge, or both. As might be expected, there is a significant difference in the support that can be derived from these structures. Teeth are connected to the surrounding bone via thin periodontal ligaments, under the function, healthy teeth may be displaced as much as 0.2 mm, in contrast, soft tissues overlying residual bone generally may be displaced 1.0 mm or more. As a result, there may be a significant difference in the support provided by the teeth and the tissues of the residual ridge. It is important to understand this difference when designing removable partial prostheses.

A practitioner also must consider the components that prevent displacement of removable partial dentures away from the underlying oral tissues. In removable partial denture design, the components responsible for retention of the prosthesis are termed direct retainers and indirect retainers. **(Mccracken et al., 2016).**

1.4 Class I Removable Partial Dentures

Kennedy Class I removable partial dentures present significant challenges for patients and dentists alike, because Class I removable partial dentures exhibit bilateral extension bases, they must derive support from the remaining teeth and residual ridges. To preserve the remaining teeth and residual ridges, removable partial dentures must provide an equitable distribution of forces. Concentration of forces upon the remaining teeth may produce rapid destruction of the periodontal tissues and potential abutment loss. Concentration of forces upon the residual ridges may produce rapid destruction of the associated tissues and an accompanying decrease in ridge height. Consequently, practitioners must carefully consider the effects of removable partial denture design upon the remaining oral structures. The following features must be included in the design of Class I removable partial dentures: provision of optimum support for the distal extension denture bases, incorporation of flexible direct retention, and provision of indirect retention. **(Leupold,1965).**

1.4.1 Optimum Support For Distal Extension Denture Bases

All portions of a residual ridge that are capable of providing support should be covered by an accurately fitting denture base. Broad coverage permits a favorable distribution of stresses, often described as a snowshoe effect. Inadequate soft tissue coverage can lead to stress concentration, breakdown of underlying bone, and a decrease in ridge volume. Adequate support of a distal extension base is often so critical that a second impression of the residual ridge is required. **(Phoenix et al., 2008)**

1.4.2 Flexible Direct Retention

Direct retainers must permit dissipation of forces resulting from denture base movement. Each direct retainer should be designed to flex or move into an area of greater undercut as forces are applied to the removable partial denture. Clasp design is a key factor in successful removable partial denture service. **(Phoenix et al., 2008).**

1.4.3 Indirect Retention

In some instances, sticky foods may lift denture bases away from the supporting tissues. This displacement produces rotation of the removable partial denture around the most posterior abutment. Rotation must be controlled to prevent damage to the remaining teeth and oral tissues. To accomplish this objective, auxiliary rests should be placed as far as is practical from the fulcrum line, they are termed indirect retainers**.(Costa et al., 2009).**

1.5 Factors Influencing Support Of the Distal Extension Base

1-Quality of soft tissue covering edentulous ridge.

2-Type of bone in the denture-bearing area.

3- Design of the prosthesis.

4-Amount of tissue coverage of denture base.

5-Anatomy of the denture-bearing area.

6-Type and Accuracy of the Impression Registration.

7-Fit of denture base.

8- Total Occlusal Load Applied. **(Stewart et al., 1992).**

1. 6 Impression Materials

Dental impression; a negative likeness or copy in reverse of the surface of an object; an imprint of the teeth and adjacent structures for use in dentistryIt is used to reproduce the form of the teeth and surrounding tissues. **(GPT2017).**

Primary impression; is a negative likeness made for the purpose of diagnosis, treatment planning, and/or the fabrication of a custom impression tray. **(GPT2017).**

secondary impression (final impression); is the impression that represents the completion of the registration of the surface or object.It is an impression made for the purpose of fabrication of prosthesis. This impression is made with individual tray. **(GPT2017).**

1.6.1 Properities Of ideal Impression

1-Accurate reproduction of surface details.

2- Easy to mix and handle.

3- Suitable working and setting time.

4-Compatible with die and stone.

5- Not toxic or allergenic to the patient.

6- Dimensionally stable on setting.

7- Has acceptable odor and taste.

8-Adequate strength.

9-Economical.

10- Ready to disinfect without loss of accuracy. **(Verraiyan, 2003).**

1.6.2 Objectives of Ideal Impression

Objectives of an ideal impression . retention, stability, support, preservation of remainng structure.

Retention: Is that quality inherent in the dental prosthesis acting to resist the forces of dislodgment along the path of placement. **(GPT9, 2017).**

Stability: Is the quality of a complete or removable partial denture to be firm, steady, or constant, to resist displacement by functional horizontal or rotational stresses. **(GPT9, 2017).**

Support: Is the foundation area on which a dental prosthesis rests; with respect to dental prostheses, the resistance to forces directed toward the basal tissue or underlying structures. **(GPT9, 2017).**

1.6.3 Classification Of Impression Materials

Impression material can be classified according to their composition, setting reaction, and setting properties, but a commonly used system is based on the properties after the material has set **as shown in figure(1.2).**

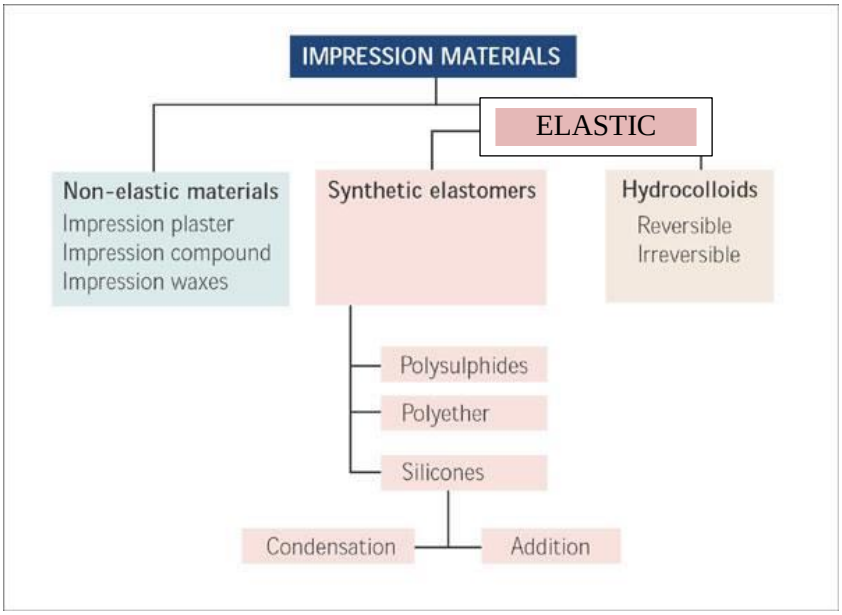

Figure 1.2: Classification Of Impression Material According To Properties Of Material After Setting. (Mccracken et al., 2016).

1.6.3.1 Rigid Impression Materials

1- Impression Plaster: It is rigid impression material, which now completely replace by elastic impression material. It is mucostatic, hydrophilic with great accuracy.

Advantages:

Dimensional stability very good.

Disadvantages:

1-the material is rigid once set, and thus unable to record undercuts.

2-patient complains very dry sensation after having impression recorded because of water absorbing nature of this material. **(Craig RG, 1988).**

2- Impression Compound

is described as a rigid, reversible impression material which sets by physical changes. On applying heat, it softens and on cooling it hardens.

Advantages:

1-This material can be reused a number of times for the same patient only, in case of errors.

2-The material has sufficient body to support itself to an extent especially in the peripheral portions.

Disadvantages:

1-It is mucocompressive.

2- surface detail is not very good.

3- It is not used to record the undercut.

4- Poor dimensional stability. **(Craig RG, 1988)**

3- Zinc Oxide Eugenol: It is rigid impression material, it registers surface details accurately due to its good flow, the material has mucostatic properties.

Advantages:

1-It has adequate adhesion to acrylic tray.

2-It is dimensionally stable, a negligible shrinkage (less than 0.1%) may occur during hardening.

3- Accurate reproduction of surface details.

Disadvantages:

1-The paste tends to adhere to the skin, so the skin around the lips should be protected with Vaseline to make the cleaning process much easier.

2- Eugenol can cause burning sensation.

3-material is rigid once set and cannot be used for making impression of teeth and undercut areas.

4- it requires a special tray for impression making**. . (Craig RG, 1988)**

4- Impression Waxes: Are rarely used to record complete impression but are used to correct small imperfection in other impression.

Disadvantages:

1-These waxes are subjected to distortion during removal from the mouth.

2-They should be poured immediately.

3-Waxes have larger coefficient of thermal expansion of any material used in restorative dentistry.

Uses; use to make functional impression of free end saddles (class I and class II removable partial dentures), to record posterior palatal seal in dentures, functional impression for obturator. **(Allen et al., 1999)**

1.6.3.2 Elastic Impression Materials

1- Irreversible Hydrocolloids (Alginate)

Alginate impression materials are used for full-arch impressions because of their low cost and good wetting properties, making them a popular choice to fabricate diagnostic casts. They can also be used for impression of

partial removable dental prosthesis frameworks and for the fabrication of immediate/interim complete or partial denture prostheses**. (Rubel, 2007)**

Advantages of Alginate:

1. Can be used in the presence of moisture saliva.

2. Hydrophilic and pour well with stone.

3. Pleasant taste and odor.

4. Non-toxic, non-staining, and inexpensive.

5. Alginate, unlike agar, does not require any special equipment and easy to manipulate.

Disadvantages:

1. Easily teared.

2. Must be poured immediately after removal from the mouth unless stored in humid environments.

3. Dimensionally unstable due to syneresis and imbibition.

4. Alginates, like agar, retard the setting of the gypsum model and die materials when in contact and should be washed with tap water well before pouring. **(Donovan et al., 2004)**

2- Reversible Hydrocolloid (agar- agar impression material)

Reversible hydrocolloid, it is supplied by the manufacturer as a preformed gel that is liquefied before use, at high temperatures the agar changes from gel to a sol, this is a reversible reaction as the material that converted from sol to a gel form after colling, hence the name reversible hydrocolloid.

Advantages:

1-It has good elastic properties and accurate reproduction of surface details.

2-It has good recovery from distortion.

3-It is hydophilic, hence gives good model surface.

4- It is well tolerated by the patient.

Disadvantages:

1-It require special equipment (agar conditioning units and water cooled tray).

2-Dimensional stability is compromised by the ease with which water can be released from (syneresis) or absorbed (imbibition) by the material.

3- The impression must be poured immediately to avoid distortion.

4- They also have poor tear strength. **(Donovan, 2004)**

3- Polyethers

These material are hydrophilic, allowing them to be used in a moist environment. Their good wetting properties also allow gypsum casts to be made more easily. These materials are available in low, medium, and high viscosity, and can be used as a single-phase material or with a syringe-and-tray. **(Powers et al., 2017)**

3- Silicone Impression Materials

The silicone impression materials are more accurate and easier to use than the other elastic impression materials. There are different type of silicone impression materials:

a- Condensation silicones:

Have a moderate (5 to 7 minutes) working time that can be altered by adjusting the amount of the accelerator. They have a pleasant odor, moderately high tear strength, and excellent recovery from deformation. Silicone impression materials are hydrophobic, which can make cast formation a problem. These materials can be disinfected in any of the disinfecting solutions with no alteration in accuracy. Ideally, these materials should be poured within 1 hour.

b- Addition Silicones Impression:

This material considered most accurate of the elastic impression materials. They have less polymerization shrinkage, low distortion, fast recovery from deformation, and moderately high tear strength. These materials have a working time of 3 to 5 minutes.They are available in both hydrophilic and hydrophobic forms, have no smell or taste, and also come in putty form, to assist in form fitting the impression tray at chairside, they are more expensive than the other elastic impression materials. (**Carr et al., 2010)**

4- Mercaptan (polysulfide) Impression Materials

The Mercaptan rubber–base (Thiokol) impression materials can also be used for removable partial denture impressions and especially for secondary corrected or altered cast impressions. To be accurate, the impression must have a uniform thickness that does not exceed 3mm. Polysulfides are supplied in two tubes of base and catalyst. Polysulfides are available in low,

medium, and high viscosities. The accuracy of polysulphide rubber base is acceptable for making impressions for removable partial dentures . **(Carr, 2010)**

Disadvantages of polysulfide:

1-Having bad odor and staining.

2- Possess a longer setting time than the irreversible hydrocolloid materials.

1.7. Tray selection

1.7.1 Custom and Stock Trays

Custom trays allow uniform impression material thickness, minimizing distortion and material waste, and are also more comfortable for patients.Custom trays have been shown to produce impressions of higher accuracy; however, newer PVS materials can still provide a quality single-unit impression when used with non-rigid stock trays. **(Donovan, 2004).**Custom trays are still indicated for clinical situations in which multiple teeth are being restored or when the arch form and size do not allow the use of a stock tray.

Use of non-rigid plastic stock trays may result in flexure of the side walls of the tray during the impression procedure; subsequent tray rebound on removal from the mouth produces an inaccurate cast and, ultimately, poor restoration fit. In contrast, use of rigid (metal) stock trays requires additional care to block out any existing undercuts on adjacent teeth or areas where the material could flow and cause problems on removal, such as pontic site. **(Donovan, 2004)**

1.7.2 Dual-arch Impression Trays

The dual-arch impression method became popular in the late 1980s**(Schwartz et al., 1992; Carr et al., 2010).** It is a closed mouth technique that allows dentists to capture the preparation, opposing teeth, and occluding surfaces in a single-step procedure. This technique is more comfortable for the patients and requires less time and material, making it a popular technique among dentists.

In 2008, 1403 impressions that were submitted to a dental laboratory to fabricate fixed indirect restorations over a 3-month period were examined to provide data with regard to tray selection. The study revealed that 73.1% of the submitted impressions were made using the dual-arch impression technique. **(Mitchell et al., 2009).**

Dual-arch impression trays should be used for single-unit prostheses or short span (up to 3-unit) fixed dental prostheses. Occlusal requirements for optimal results when using this technique include a stable maximum intercuspation with absence of interferences and intact dentition. **(Kaplowitz,1996)**

There are many types of dual arch trays available (full or partial arch, metal or plastic, possessing side walls or sideless), and selection is based on clinical parameters, such as arch form and size or position of the teeth. **(Faria et al., 2008)**

1.8.Impression Techniques:

1.8.1.Conventional Technique

One stage impression method that records the hard and soft tissues at rest, also known as anatomical or mucostatic. The surface contour of

the ridge is recorded at its resting form (no occlusal load) so the edentulous ridges don't contribute to the support of the R.P.D. Single, pressure free impression, records the teeth and soft tissues in their anatomic form. The material of choice (soft or less viscous impression material) alginate. It is recommended for tooth supported partial dentures Kennedy's class III and IV - These are bounded saddles. **(Carr et al., 2004).**

Select a suitable perforated impression tray that is large enough to provide a 5-7 mm border thickness of the impression material. Built up the palatal portion of the maxillary impression tray. Position the patient in an upright position, with the involved arch nearly parallel to the floor. The lingual flange of the mandibular tray may need to be lengthened with beeswax in the retromylohyoid area or to be extended posteriorly, but it rarely ever needs to be lengthened elsewhere. Beeswax may need to be added inside the distolingual flange to prevent the tissues of the floor of the mouth from rising inside the tray. Place the patient in an upright position, with the involved arch nearly parallel to the floor. When using alginate hydrocolloid, place the measured amount of water (at 70°F) in a clean, dry, rubber mixing bowl (600ml capacity). Add the correct measure of powder. Spatulate rapidly against the side of the bowl with a short, stiff spatula. The impression material is being mixed and the tray is being loaded **(figure;1.3)**. **(Carr,2011 and Stewart,2014).**

Figure 1.3: Alignate impression by using anatomic impression technique (Carr,2011)

The problem of an anatomic impression:

In a distal extension condition is that the removable partial denture would have optimum occlusal contact in rest but on clenching or under mastication, the denture base sinks down along with the displaced mucosa, both reducing the efficiency of mastication and torqueing the abutment. Moreover, when occlusal forces are applied, the denture base behaves as a harmful lever that rotates with the abutment teeth as fulcrum and concentrates the occlusal forces on a small area on the distal end of the edentulous ridge where the denture base terminates. This area is subjected to rapid resorption due to overload. **(Carr et al., 2004).**

1.8.2 Functional Impression Technique:

Functional impressions are defined as "The impression which records the form of the residual alveolar ridge under some loading whether by occlusal loading, finger loading, specially designed individual tray or consistency of recording medium. **(Academy Of Prosthodontics, 2005).**

1.9 History Of Functional Impression:

Applegate used impression wax to load functionally the residual ridge. Hindel felt that the free-end denture base under masticatory load should be related to the metal framework when it is seated. Holmes used four different materials with an altered cast technique. Leupold & Kratochvil used Zinc-oxide Eugenol paste to record the shape of residual ridges. Kramer & Singer used a double impression technique based on load constructing mandibular distal extension based partial denture. **(Brudvik, 1999).**

1.10 Indications For Functional Impression:

Because the displaceability of the mucosa of the residual ridge is not uniform. The need for functional impression arises in cases of distal extension-based partial dentures and with short-span distal extension bases. Some patients does not exhibit a significant difference in the anatomical and functional form of the ridge. **(John et al., 2004).** In some patients, soft tissue displacement is slight. As a result, the functional and anatomic contours of the ridge may be virtually identical. **The decision to use a functional impression technique may be determined using the following test:**

(1) Acrylic resin bases are added to the framework.

(2) The framework is placed in the mouth and finger pressure is applied to the base. If the base can be depressed enough that the indirect retainers or lingual lifts away from the teeth, a functional impression technique should be used. **(John et al., 2004).**

The functional impression technique is often indicated for mandibular distal extension applications because only a limited ridge area can be used as a stress-bearing site. The other indication for a dual impression technique is a long-span anterior edentulous base (normally including at least the six anterior teeth) where the ridge must supply some support for the prosthesis. **(Brudvik, 1999).**

1.11. Objectives Of Functional Impression:

The objective of any functional impression technique is to provide maximum support for the removable partial denture bases. This allows for the maintenance of occlusal contact between natural and artificial dentition and, at the same time minimal movement of the base, which would create

leverage on the abutment teeth. Although some tissue-ward movement of the distal extension base is unavoidable and is dependent on the six factors listed previously, it can be minimized by providing the best possible support for the denture base. (**Carr et al., 2004).**

1.12. Methods For Obtaining Functional Support for the Distal Extension Base:

1.12.1 Physiologic impression technique: Physiologic Impression Techniques

1- McLean’s technique.

2- Hindel’s technique.

3- Functional reline technique.

4- Fluid wax technique.

1.12.1. 1 McLean's method:

The need for physiological impressions was first proposed by McLean and others. They realized the need for recording the tissues of the residual ridge in a functional form while capturing the remaining teeth in the anatomic form. As a result, they developed a dual impression technique. To accomplish their objectives, these practitioners constructed a custom tray on a diagnostic cast. A functional impression was made using this tray with suitable impression material. A hydrocolloid "over-impression" was then made while maintaining the functional impression in its intended position. The greatest weakness of the technique was that practitioners could not produce the same

functional displacement generated by occlusal forces **(figure; 1.4). (Brudvik, 1999)**

Disadvantages

1- The bite force exerted by the patient cannot be controlled by the operator.

The bite force need not be same as the masticatory force

2-The pressure exerted while making the over- impression need not be the same as the bite force. Hence difference in displacement.**(Rudd, 2001).**

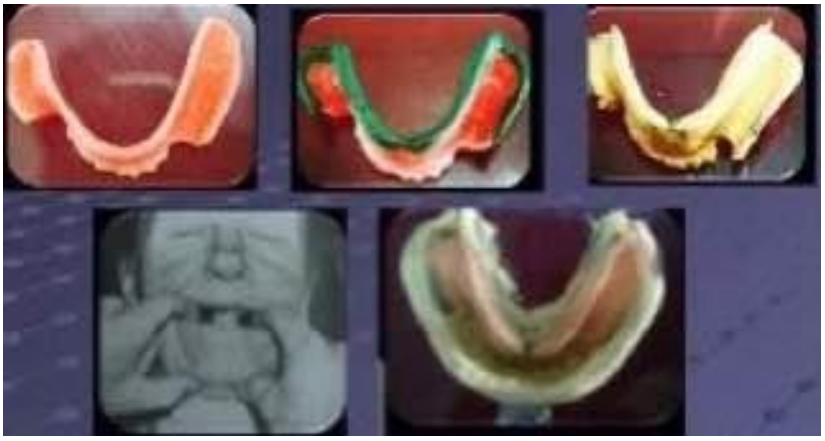

Figure 1.4: McLean's Technique. (Brudvik, 1999)

1.12.1. 2 Hindel's modification for McLean's method:

Hindels and others developed modified impression trays for the second impression procedure. These trays had large holes in their posterior segments As a result, the operator could apply finger pressure to the functional impression as the hydrocolloid impression was being made. The finished impression was a reproduction of the anatomic surface of the ridge and the surfaces of the teeth. The two were related to each other, however, as if forces were taking place on the denture base **(figure 1.5)**.

The disadvantages of these techniques are closely related to direct retention. If the action of the retentive clasps is sufficient to maintain a denture base in its intended position, the tissues of the ridge will be in functional form. This may result in compromised blood flow with adverse soft tissue reaction and resorption of the underlying bone. If the action of the retentive clasps is not sufficient to maintain that functional relationship of the denture base to the soft tissues, the denture base will be occlusal positioned when the soft tissues are at rest. This results in premature contact of the artificial teeth, which may be objectionable to many patients. **(Hindels, 2001)**

Figure 1.5: Hindel’s technique. (Hindels, 2001)

1.12.1. 3 Functional relining method:

According to Leupold in 1965, the functional reline method is accomplished after the denture base has been processed onto the framework. The technique consists of adding a new surface to the intaglio of the denture base. The procedure may be accomplished before the insertion of the partial denture, or it may be done at a later date if the denture base no longer fits the ridge adequately. Although the functional reline method has many advantages, it also presents many difficulties. The main problems are caused by failure to maintain the correct relationship between the framework and the abutment teeth during the impression procedure and failure to achieve accurate occlusal contact following the reline procedure. **(Jepson, 2004).**

The partial denture is constructed on a cast made from a single impression, usually irreversible hydrocolloid. This is an anatomic impression, and no attempt is made to alter it or produce a functional impression of the edentulous ridge, to allow room for the impression material between the denture base and the ridge, space must be provided. The patient must keep the mouth partially open throughout the procedure to permit appropriate tissue control and the required visual assessment. Low-fusing modeling plastic is applied to the intaglio of the denture base, tempered in a water bath, and seated in the patient's mouth **as shown in (figure; 1.6). (Jepson, 2004)**

Figure 1.6 : Functional relining technique. (Jepson, 2004)

This sequence must be repeated until an accurate impression of the edentulous ridge has been accomplished. The border extensions are determined by heating to the border and guiding the placement of the cheek and tongue. To provide space for the impression material, 1mm of modeling plastic is removed from the intaglio surface. In the functional reline procedure, as in all reline procedures, occlusal discrepancies must be corrected after the new denture base has been processed. Since the open-mouth impression technique must be used, it is impossible to maintain previously established occlusal contacts. If errors in occlusion are slight, the correction may be accomplished in the mouth. However, in a majority of cases, it will be necessary to remount the partial denture on an articulator to correct the occlusion. **(Jepson, 2004)**

1.12.1.4 The Fluid Wax Technique:

The fluid wax impression may be used to make a reline impression for an existing partial denture or to correct the edentulous ridge portion of a master cast. The objectives of the technique are to obtain maximum extension of the peripheral borders while not interfering with the function of movable border tissues, **(Carr, 2011)** and to record the stress-bearing areas of the ridge in their functional form**. (Stewart, 2014).**

The fluid wax made using an open-mouth technique so that there is less danger of over displacement of the soft tissues by occlusal or vertical forces. The term fluid wax is used to denote waxes that are firm at room temperature and have the ability to flow at mouth temperature. The use of fluid wax requires control of the critical factors of space and time. Space refers to the amount of relief provided between the impression tray and the edentulous ridge. The impression wax flows sluggishly, and a thin layer of wax will flow less readily than a thicker layer. A two millimeters of relief is required between the tray and the tissues of the edentulous ridge. Each time the tray is introduced into

the mouth, it must remain in place 5 to 7 minutes to allow the wax to flow and to prevent buildup of pressure under the tray with resulting distortion or displacement of the tissue.

The clinical technique for the use of fluid wax in a water bath maintained at 51°C to 54 oC (125 °F to 130 °F), into which a container of the wax is placed at this temperature the wax becomes fluid, the wax is painted onto the impression tray with a brush to a depth slightly greater than the amount of relief provided, the tray is then seated in the mouth, the patient must hold the mouth half open for about 5 minutes. The tray is removed, and the wax is examined for evidence of tissue contact. Where tissue contact is present, the wax surface will be glossy where there is no contact, the surface will be dull. If needed, additional wax is painted on those areas not in contact with the tissue. The tray must remain in the mouth a minimum of 5 minutes after each addition of wax. The peripheral extensions are developed by tissue movements by the patient **as shown in (figure 1.7).**

For the proper extension for a mandibular impression, the patient must thrust the tongue into the cheek opposite the side of the arch being border molded. The disto-lingual extension is obtained by having the patient press the tongue against the lingual surfaces of the anterior teeth. When the impression shows evidence of tissue contact and the anatomy of the limiting bone structures has been established, the impression is positioned in the mouth for a final time. The impression should be left in the mouth for 12 minutes to ensure that the wax has completely flowed and released pressure that may be present. The finished impression must be handled carefully and the new cast poured as soon as possible because the wax is fragile and subject to distortion.

The advantage of fluid wax impression technique can produce an accurate impression if the technique is properly executed. **The disadvantage**

of the procedure is time consuming, but if the time periods are not followed accurately, an impression with excessive tissue displacement will result. **(Stewart, 2014)**

Figure1.7: The Fluid Wax Technique. (Stewart, 2014)

1.12.5 Selective Pressure Impression Technique:

The selective pressure impression attempts to direct more force to those portions of the ridge able to absorb stress and to protect the areas of the ridge least able to absorb stress. The selective tissue placement impression method is based on clinical observations, the histological nature of tissues that cover the residual alveolar bone, the nature of the residual ridge bone, and its positional relationship to the direction of stresses that will be placed on it. It is further believed that by use of specially designed individual trays for impressions, denture bases can be developed that will use those portions of the residual ridge that can withstand additional stress and at the same time relieve the tissues of the residual ridge that cannot withstand functional loading and remain healthy.

The tray is unquestionably the most important part of an impression. However, a tray must be so formed and modified that the impression philosophy of the dentist can be carried out. Because the goal is to maximize soft tissue support while using the teeth to their supportive advantage, the framework fitted to the teeth while soft tissue support is registered provides a means of coordinating both, this means that before the trays are attached, the framework must be fitted in the mouth. **(Leupold,1965).**

Fitting the Framework Involves The Following Steps:

1. Use of disclosing media to identify interferences to completely seating the removable partial denture framework.

2. Use of disclosing media to identify the appropriate contact of the component parts of the framework during seating of the framework and when the framework is completely seated in its designated terminal position.

3. Adjusting the seated framework to the opposing occlusion. If there are opposing frameworks, the maxillary framework is removed from the mouth and the mandibular framework is adjusted to the natural maxillary dentition; then the maxillary framework is replaced and it is adjusted to mandibular dentition with its framework in place. It is important to remember that the metal frameworks must allow all of the natural dentition to maintain the same designed contact relationship with the opposing arch as when the frameworks are out of the mouth. After the framework has been fitted and the custom trays have been attached, selective tissue placement impression and cast formation can accomplished**.(Carr, 2011 and Stewart, 2014).**

1.13 Altered Cast Technique

The altered cast impression is an attempt to combine the support of the abutment teeth with the support that can be obtained from the edentulous ridge **(Chandrashekar, 2010)**. Originally, altered cast impressions were made on any edentulous area that had no posterior abutment, either maxillary or mandibular. Since the maxillary RPD is so well-supported by the major connector and the primary stress bearing include the posterior crests and horizontal portions of the hard palate, little additional support is gained with an cast impression for a maxillary distal extension area, especially if the final impression was made in custom tray. The difficulty capturing the total denture space of the mandibular distal extension in the primary stress bearing areas in final impression and because the primary stress bearing areas are limited to the buccal shelves; this has made the altered cast impression essential for all mandibular Class I and II situations **(Leupold,1965 and Stewart,2014)**. as shown in **(figure 1.8).**

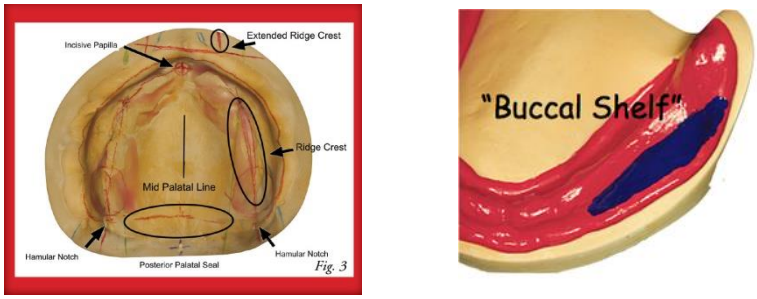

Figure 1.8: primary stress bearing area for maxillary and mandibular arch (Stewart,2014)

Instead making the best possible impression of the teeth to be connected by the partial denture. It is essential that the full extent of the denture space in the distal extension of the edentulous ridge be captured so that the outline of the desired altered cast tray can be drawn as apart or the design. (**Feit, 1999 and Stewart, 2014).**

The altered cast tray is constructed on the master cast after the casting has been completed. The tray must be kept to the dimensions of the ideal denture base to form the ideal denture border, the tray must be uniformly short and be slightly under contoured 2-3 mm to make space for the impression material to capture the border without becoming bulky. When the occlusal portion of the tray is kept thin it will occasionally be possible to make the final jaw relation record at the same appointment as the altered cast impression. If at that time the patient is unable to close the teeth into the desired occlusion for the record because of the thickness of the tray or the general lack of interocclusal space, the jaw registration must be made at a separate appointment. The altered cast impression is made only after the framework has been fitted to the mouth and the full seating of the casting framework verified firmly on the abutment teeth. Border molding with tracing compound i.e. (green stick) is undertaken to simulate final denture border. Excess saliva should be removed from the month, but there is no reason to have the mouth totally dry. The tray is loaded with just enough material and an additional 20% is added to assure full border contours. There must be no excess material at the internal finishing line, as this material can flow up into the guide plate area when the frame is seated. When placing the framework in the mouth, the clinician must make sure that the frame is fully seated and that no pressure is placed on the tray itself. The fingers are placed on three widely separated rests to maintain the frame in its optimum position while the borders are developed and the material sets. **(Feit et al., 1999).**

When fully set the impression is removed from the mouth and trimmed to remove any excess impression material. There will normally be a thin extension of the material into the retromolar space on mandibular impressions and an extension of material onto the soft palate for the occasional maxillary impression. Any borders of insufficient width can be recreated in wax if they are extended to the pre-determined limits .A final verification of the distal extension impression must be made after the base is trimmed and shaped. At this point a jaw relation record can be made if required and if adequate space for the record exists.Pouring the altered cast impression can be delegated to the technician. but the clinician must verify that the Framework is fully seated on the master cast and that sticky wax has been added to hold the cast and frame together during the boxing and pouring of the stone. **(Frank et al., 2004).**This means that the original edentulous portion of the master cast must have been removed earlier and that adequate retention has been cut into the remainder of the master cast. Rather than go through an elaborate boxing process. The clinician may elect to pour the altered cast impression in two stages, much as was done for the master cast.

The border roll of the altered cast impression must be preserved in the boxing and pouring of the impression. A line is drawn on the impression with an indelible marker just at the point where the border contour is complete. Boxing material is placed at this line to create a land area of 3 mm, the impression is filled with vacuum-mixed stone. **(Stewart et al., 2014).**

This technique has the potential benefits of reducing the number of postoperative visits **(Chandrashekar, 2010)**, preserving the residual ridges, improving stress distribution, decreasing food impaction and decreasing the torqueing of abutment teeth leading to increased patient satisfaction. **(Christensen,1995).**

Using addition cured silicone material to portray an approach of recording a minimal tissue displacing altered cast impression. It was aimed to improve the tissue support for the distal extension base by minimally displacing the soft tissue during the impression procedure. **(Rashid et al., 2013).**

By using the 2-step (altered cast) impression technique in the prosthetic rehabilitation of a patient after a maxillectomy it was possible, despite trismus, to make an accurate impression of the non-resected part of the maxilla and the resection defect. With the use of a secondary (altered cast) impression, the primary stone cast was modified to produce a definitive altered cast. The maxillary hollow bulb obturator ensured adequate closure of the resection defect with adequate obturator retention, stability, and support, thus improving oral function, speech, and esthetics **as shown in figure(1.9). (Denis and Josip, 2013)**

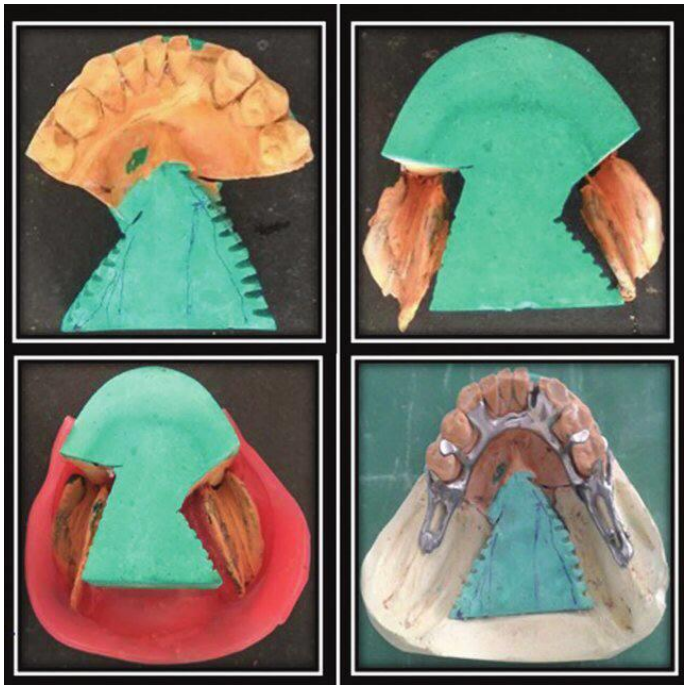

Figure 1.9: Altered cast technique.(Frank et al., 2004)

CHAPTER- TWO
CONCLUSION

Conclusion: Within this review we may conclude that the accuracy of distal end extension impression for Cl I or Semicomplete is multifactorial point and each factors have a relation directly or indirectly with the accuracy of impression procedure for Cl I or Semicomplete denture.

REFRENCES

References

A

-*Allen EP, Bayne SC, Becker IM, et al: Annual review of selected dental literature: report of the committee on scientific investigation of the American Academy of Restorative Dentistry, J Prosthet Dent 82:50, 1999.*

-Academy Of Prosthodontics). The Glossary of prosthodontic terms. St.

Louis: Mosby (2005).

B

Brudvik, J.S.. Advanced removable partial dentures. Chicago: Quintessence Pub. Co (1999).

C

- Carr, A. B., Brown, D. T. McCracken's Removable Partial

Prosthodontics-E-Book: Elsevier Health Sciences(2010).

- Craig RG: Review of dental impression materials, Adv Dent Res 2:51, 1988.

- *Clark RJ, Phillips RW: Flow studies of certain dental impression materials, J Prosthet Dent 7:259-266, 1957.*

- *Combe EC, Burke FJ, Douglas WH. Dental biomaterials, 1st edition.*

Boston: Kluwer; 1999.

- *Carr AB, Brown DT. McCraken's Removable Partial Prosthodontics.12th Edition. Mosby: 2011. Chapter 16. P 232.*

- *Carr, A.B., Mcgivney, G.P., Brown, D.T. and Mccraken, W.L. (2004).*

McCracken's removable partial prosthodontics. London: Mosby.

-*Chandrashekar Sajjan. An altered cast procedure to improve tissue support for removable partial denture. Contemp Clin Dent, 2010;1 (2):103-06.*

-*Christensen G. Making better removable partial dentures. J Am Dent Assoc 1995 126:1041-44.*

D

-*Darby H, Darby LH. Copper-band gingival retraction to produce void-free crown and bridge impressions. J Prosthet Dent 1973;29(5):513–6.*

- *Donovan TE, Chee WW. A review of contemporary impression materials and techniques. Dent Clin North Am 2004;48(2):vi–vii, 445-470.*

- *Davenport, J & Basker, R & Heath, J & Ralph, J & Glantz, Per-Olof. (2000). Removable partial dentures: an introduction. British dental journal. 189. 363. 10.1038/sj.bdj.4800769a.*

F

Farah JW, Powers JM: Alginate impression materials, Dent Advis 18(4):1, 2001

- *Feit DB. The altered cast impression technique revisited. J Am Dent Assoc., 1999 oct;130(10): 1476-81.*

-*Frank RP, Brudvik JS, Noonan CJ. Clinical outcome of the altered cast impression procedure compared with use of a one piece cast. J Prosthet Dent. 2004 May, 91:468-476.*

G

-*Glossary of prosthodontics term (2017)*

H

Hindels, G.W. (2001). Load distribution in extension saddle partial dentures. The Journal of Prosthetic Dentistry, 85(4), pp.324–329.

J

- *John Russell Agar and Thomas Dean Taylor (2004). Removable prosthodontics. Philadelphia: Saunders, Cop.*

- Jepson, N.J.A. (2004). Removable partial dentures. London; Chicago: Quintessence Pub.

K

-Kaplowitz GJ. Trouble-shooting dual arch impressions. J Am Dent Assoc 1996;127(2):234–

-Kenneth L. Stewart, Kenneth D. Rudd, William A. Kuebker. Clinical removable partial prosthodontics. 2nd edition. 373-392.

L

Leupold, R.J. and Kratochvil, F.J. (1965). An altered-cast procedure to improve tissue support for removable partial dentures. The Journal of Prosthetic Dentistry, 15(4), pp.672–678.

M

-Mohamad Rasidi, Mohamad Qulam Zaki Bin. (2017). Impression Techniques in Removable Partial Denture. International Journal of Current Research. 9. 49514-49516.

- Mccracken, W.L., Carr, A.B. and Brown, D.T. (2016). McCracken's removable partial prosthodontics. St. Louis: Elsevier, Cop.

-Mitchell ST, Ramp MH, Ramp LC, et al. A preliminary survey of impression trays used in the fabrication of fixed indirect restorations. J Prosthodont 2009;18(7): 582–8.

N

- Nawaz, Muhammad & Muhammad, Faheemuddin & Yazdanie, Nazia. (2012). Acrylic interim denture two-part impression technique

P

-Powers J, Wataha J. Dental materials foundations and applications. 11th edition. St. Louis (MO): Elsevier; 2017. 9.

R

-Reitz CD, Clark NP. The setting of vinyl polysiloxane and condensation silicone putties when mixed with gloved hands. J Am Dent Assoc 1988; 116(3):371–

- Rubel BS. Impression materials: a comparative review of impression materials most commonly used in restorative dentistry. Dent Clin North Am 2007;51(3): 629–42, vi.

- Rashid H.,Vohra FA, Shahzad A.Altered cast technique:improving tissue support for the distal extension base,J Pak Dent Assoc,2013;vol:22, P.P:234-236.

S

- Schwartz R, Davis R. Accuracy of second pour casts using dual-arch impressions. Am J Dent 1992;5(4):192–4.

- Stewart K., Kuebker W. Clinical Removable Partial Prosthodontics. 4th edition 2014, St Louis, MO: Mosby, p.381-400.

- *Stewart, K.L., Rudd, K.D. and Kuebker, W.A. (1992). Clinical removable partial prosthodontics. Pacific, Mo: Medico Dental Media International, Inc.*

- Stewart's clinical removable partial prosthodontics. Hanover Park, Il: Quintessence Pub.

V

Verraiyan, DN 2003, Textbook of Prosthodontics, 1st edn, Jaypee Brothers, Chennai.

Y

Yung-tsung Hsu, DDS, MS.Use of polyvinyl siloxane material for an altered cast impression tray ،J Prosthet Dent.2014.