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Altered Cast technique in RPD

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(إِذَا جَآءَ نَصۡرُ ٱللَّهِ وَٱلۡفَتۡحُ ۝ وَرَأَيۡتَ ٱلنَّاسَ
يَدۡخُلُونَ فِي دِينِ ٱللَّهِ أَفۡوَاجٗا ۝ فَسَبِّحۡ بِحَمۡدِ رَبِّكَ
وَٱسۡتَغۡفِرۡهُۚ إِنَّهُۥ كَانَ تَوَّابَۢا ۝)

صدق الله العلي العظيم

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Certification of the Supervisor

I certify that this undergraduate dissertation entitled "Altered Cast technique in RPD" was prepared by Amany Neama Hamza under my supervision at the College of Dentistry / University of Baghdad in partial fulfilment of the requirements for B.D.S degree.

Signature:

Lect. Mustafa Mahdi.

Date**:**

Dedication

To my father

I know that you see me from heaven and pray for me, you are the hero who spent his life in my education, my livelihood and always believed in me.

To my mother

The heroic woman who resisted everything for us, and supported me in all circumstances in my life until I reached what I am.

To my brothers and my best friend

Their words, their constant support and encouragement to me all the time made me resist the toughest challenges.

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Abstract

Background: The altered cast impression technique of fabricating removable partial dentures, originally described more than 60 years ago, improves the residual-ridge-to-dentition relationship of the prosthesis. This potentially increases patient satisfaction while preserving the remaining supporting structures.

Purpose: The purpose of this study was to determine the efficacy of an altered cast impression technique compared to conventional methods concerning RPD support and patient comfort over time.

Conclusion: The altered cast impression procedure offer an advantages over the conventional method, provided the standards used in this study are met. These include a completely extended impression, complete seating of the framework, and coverage of the retromolar pad and buccal shelf by the base.

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Introduction

Mandibular distal extension removable partial dentures usually require the altered cast impression procedure during fabrication or a relining at time of insertion to improve the stability and support of the prosthesis. **(Frank etal, 2004)**

In the field of construction of distally extended partial denture had linked the optimum mucosal support to the method of making impressions and materials used, in an attempt to relate between teeth, hard tissues and soft tissues covering edentulous ridges. **(AL EL-Sheikh etal, 1998)**

Several studies have demonstrated the advantages of the altered cast impression technique that compared with use of a conventional method. **(Leupold etal, 1992)**

The removable partial denture fabricated using altered cast impression technique is believed to promote patient comfort and preserve oral health. **(Feit, 1999).**

For restoration of missing posterior teeth in distal extension edentulous ridge the displacements are quite different between the residual ridge mucosa and the periodontal support tissues of abutment. **(Holmes, 1965).**

A correct design for a removable partial denture should prevent rotary movement in order to protect the supporting tissues, therefore, the altered cast impression technique for distal extension removable partial denture attempts to accommodate the difference in resiliency of soft tissue overlying the edentulous ridges and the periodontium of abutment teeth. **(Maxfield etal, 1979 and Jorge etal, 2007).**

When restorative procedures are not carried out properly, further damage can result. **(Jorge etal, 2007)**,with this in mind, the present study was designed to compare the RPD support and patient comfort in patients receiving RPD constructed from altered cast impression techniques.

Aims of the Review

1. To review the advantages and disadvantages of altered cast technique.
2. To review the indications of altered cast technique.
3. To review the materials that used in altered cast technique.

CHAPTER ONE

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Distal extension removable partial denture (RPD) depends largely on the residual alveolar ridge for support, stability and retention. These dentures only have partial support from teeth as their bases may be the extensions covering the ridge distal to the last abutment tooth. The tooth supported RPDs have an advantage of presence of a direct retainer whereas this is lacking in the prosthesis fabricated over distal extension bases. Support from the residual alveolar ridge as described by **Carr and Brown in 2011**, will depend on several factors which include the quality of the residual alveolar ridge and its contour, extent of the ridge covered by the RPD, the accuracy of the impression, fitting accuracy of the denture, RPD design and the total occlusal load applied during function. **(Carr et al., 2004).**

The distal extension removable partial denture has inherent problems of retention and stability, affecting not only the integrity of denture-bearing tissue and associated structures but also patients' acceptance and compliance. **(DE FREITAS et al., 2012).**

The distal extension partial denture not only must depend on the residual ridge for some support but also should obtain some retention from its base, aided by indirect retention to prevent the denture from lifting away from the residual ridge, whereas the tooth-supported base is secured at either end by the action of a direct retainer and supported at either end by a rest, this degree of support and direct retention is lacking in the distal extension restoration. **(Mccracken, Carr and Brown, 2016).**

Although the corrected or altered cast impression technique is widely taught, it seems to be used very little in the past because it requires separate appointments for framework try in, corrected cast impression, and occlusal registration. **(FEIT, 1999).**

The altered cast impression technique of fabricating removable partial denture originally described more than 60 years ago, improves the residual ridge to dentition

relationship of the prosthesis. This potentially increases patients satisfaction while preserving the remaining supporting structures. **(Walton, 1993)**.

An altered cast impression procedure to improve the support of distal extension removable partial dentures is widely taught, but not often used in dental practice. **(Frank, Brudvik, and Noonan, 2004d).** Also known as the corrected-cast technique **(Nakai, 2020)**, the technique requires an additional step for both the dentist and the dental technician. It offers several advantages which include maximum stability, minimal stress on abutment teeth, and more predictable occlusion. **(Nakai, 2020)**. Other benefits include reduction of the number of post-operative visits, preservation of the residual ridges, and decreasing the food impaction.

Free end saddles are liable to be displaced under occlusal pressure. This can be because of the displaceability of the mucosa. **(Sajjan, 2010)**. With removable partial dentures that are completely tooth-supported as in Kennedy's class III and many class IV partially edentulous arches, the occlusal forces are transmitted to the abutment teeth are directed vertically down the long axes of the teeth through the occlusal, incisal, or lingual rests. The edentulous ridges will not contribute to the support of partial dentures because the teeth absorb these forces before the forces are transmitted to the residual ridge. A tooth-supported removable partial denture can be constructed on a master cast made from a single, pressure-free impression that records the teeth and ridge in their anatomic form. A tooth tissue-supported removable partial denture constructed on such a cast, however, will exert excess pressure on the teeth that help to support the denture as the soft tissue under the denture base compresses. (**Stewart, et al 1992).**

It is necessary to make an impression of mucosa for a distal extension removable partial denture base in its functional form (supporting form) instead of its resting form so that the base can be related to the metal framework in the same relationship that exists

between the abutment tooth and the supporting mucosa when an occlusal force is applied to the base. **(Stewart etal 1992).**

Several methods may be used for registering the mucosa in its supporting form. Two well-known methods are **the functional reline** and **the altered cast**.

The functional reline method is accomplished after the denture base has been processed onto the framework. The disadvantages of this method are that it requires a greater degree of occlusal adjustment after the processing of acrylic resin and presentation to the patient and that it is necessary to modify the new denture before it has been worn. The altered cast method is carried out before the denture bases are processed. The metal framework is fitted with baseplates covering the mucosa of the distal extension denture base. The final impression is registered with mouth-temperature wax, zinc oxide-eugenol paste, or one of the rubber base impression materials. **(Walter, 1990).**

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." Several methods may be used for registering the mucosa in its supporting form. An altered cast impression procedure to improve the support of distal extension removable partial dentures is widely taught, but not often used in dental practice. **(Stewart, Rudd and Kuebker, 1992).**

1.1.Tooth loss and Removable Partial Denture:

Tooth loss is a permanent condition in that the natural order has been disrupted, and in this sense it is much like a chronic medical condition. Like hypertension and diabetes, two medical conditions that are not reversible and that require medical management to monitor care to ensure appropriate response over time, tooth replacement prostheses must be managed to ensure appropriate response over time **(Carr, 2011 and Stewart, 2014).**

Patient use of removable partial denture has been high in the past and is expected to continue in the future. Some patients who are given the choice between a prosthesis entirely supported by implants or a removable partial denture are not able to pursue implant care. This contributes to higher use of removable partial dentures. These findings suggest that it should strive to understand how to maximize the opportunity for providing and maintaining stable prostheses because this is the most frequently deficient aspect of removable partial denture service. **(Carr, 2011and Stewart, 2014).**

1.2. Tooth-Supported Prostheses:

Removable partial dentures can be designed in various ways to allow use of abutment teeth and supporting tissue for stability, support, and retention of the prosthesis. In terms of tooth-bound spaces, the removable partial denture is like a fixed partial denture because natural teeth alone provide direct resistance to functional forces. **(Stewart, 2014).**

When occlusal forces are applied to a tooth-supported removable partial denture, they are directed through the rests and transmitted to the abutments as shown **in fig (1)**.

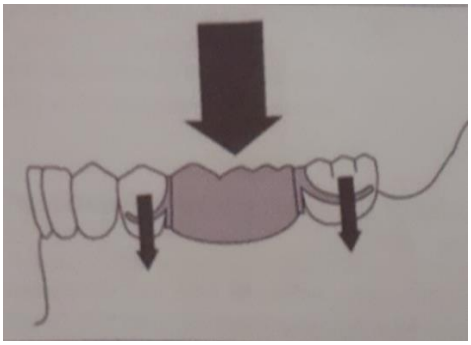

Fig1:Forces on a tooth supported RPD.

The edentulous ridges do not contribute to the support of the partial denture because the teeth absorb these forces before the forces can be transmitted to the tissues of the residual ridge. Since the denture base does not contribute to the support of the partial denture and the underlying mucosa and bone are not subjected to functional forces, a tooth-supported removable partial denture can be constructed on a master cast made from a single impression that records the teeth and soft tissues in their anatomic form. **(Zarb, 2013).**

1.3. Tooth and Tissue-Supported Prostheses:

For removable partial dentures that do not have the benefit of natural tooth support at each end of the replacement teeth (extension base removable partial dentures), the residual ridge must be used to assist in the functional stability of the prosthesis. When removable partial dentures are selected for a tooth- tissue-supported arch, the prosthesis must be designed to allow functional movement of the base to the extent expected by the residual ridge mucosa. This mucosa movement is variable, but for healthy residual ridge (masticatory mucosa, movement from 1 to 3 mm can be expected). **(Zarb, 2013)**.

Consequently, unlike with the tooth-bound space, tooth modification for the tooth-tissue-supported prosthesis must be designed with the dual goal of framework

tooth contact to allow appropriate functional stability from the tooth, but with allowance for the anticipated vertical and/or horizontal movement of the extension base. This introduces the concept of anticipated movement with a prosthesis and the requirement that we have a role in designing prostheses to appropriately control movement. **(Carr, 2011)**.

When an occlusal load is applied to a distal extension removable partial denture, the prosthesis rotates around a fulcrum line that passes through the most posterior rests one on each side of the dental arch. Displacement of the prosthesis is limited by the hard and soft tissues of the residual ridge as shown **in fig (2)**.

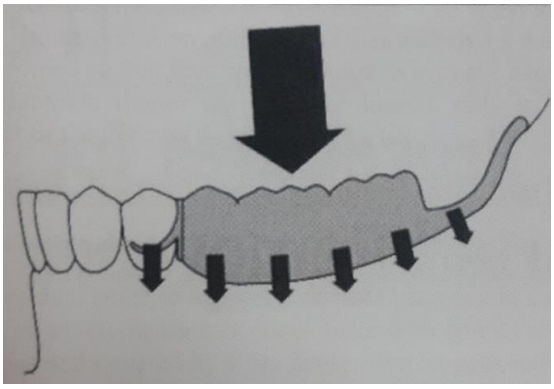

Fig 2:forces applied to a tooth-tissue-supported RPD. **(Carr et al., 2004)**.

Therefore, optimal resistance to displacement may be provided by broad and accurate adaptation of the denture base(s) to the supporting tissues. The chosen impression technique (eg, selective pressure or mucostatic) may exert a significant influence on the amount of denture base movement that results from functional loading. Forces acting to dislodge the prosthesis in an occlusal direction also must be considered. Sticky foods or other substances may pull on the artificial teeth and move the extension base away from the underlying ridges. **(Applegate, 1960 and Stewart, 2014)**.

1.4 Denture bases:

Most denture bases are constructed using acrylic resins or cast metal alloys. The acrylic resins are typically heat-activated or chemically-activated poly methyl methacrylate resins. These resins are available in a variety of shades and may be used the desired gingival colors and contours. Consequently, acrylic resin denture bases are preferred by most practitioners Denture bases also may be created using cobalt-chromium alloys, nickel- chromium alloys, Type IV gold alloys, titanium-aluminum-vanadium alloys, and commercially pure titanium. **(Stewart, 2014)**.

Advantages of metal denture bases include increased strength, improved adaptation to underlying tissues, improved hygiene, and enhanced thermal conductivity. **(Kuebker, 2014).**

1.5 Support of Distal Extension Based Partial Denture:

Support: is the resistance to vertical components of masticatory force in a direction toward the basal seat. A minor support comes from the abutment teeth. The major support comes from elastic fibrous connective tissue pad overlying the alveolar process. **(Carr, 2011)**.

Residual ridge: It is the remnant of the alveolar process together with the fibrous connective tissue covering & (included structures) in an edentulous area of the dental arch; The residual ridge may be said to have two forms:

1. ***Anatomic form:*** is the surface contour of the ridge when it is not supporting an occlusal load. **(Carr, 2011)**.
2. ***The functional form:*** is the surface contour of the ridge when it is supporting a functional load. The support form of the soft tissues underlying the base of the denture should be recorded so that firm areas are used as primary stress bearing areas are readily displaceable tissues over

loaded, only in this way can maximum support of the base be obtained. **(Carr, 2011 and Stewart, 2014)**.

1.6. Factors influencing the support of distal extension base:

1- Quality of the residual ridge: The ideal residual ridge to support a denture base would consist of cortical bone that covers relatively dense cancellous bone with abroad rounded crest and high vertical slopes and covered by firm, dense, fibrous connective tissue. Easily displaceable tissue will not adequately support denture base, and tissues that are interposed between a sharp, bony residual ridge and a denture base will remain in a healthy state. Not only must the nature of the bone of the residual ridge be considered in developing optimum support for the denture base, but also its positional relationship to the direction of forces that will be placed on it. **(Applegate, 1960, Carr , 2011 and Stewart, 2014).**

2-Extent of residual ridge coverage by the denture base: A denture base should cover as much physiologic tolerance of the limiting border structures or tissue. The broader the residual ridge coverage the greater the distribution of the residual ridge as possible and be extended the maximum amount within the physiologic tolerance of the limiting border structures of tissue. **(Applegate, 1960 and Carr, 2011).**

3-Accuracy of denture base: Distal extension base is enhanced by intimacy of contact of the tissue surface of the base and the tissue that covers the residual ridge. The tissue surface of the denture base must optimally represent a true negative of the basal seat regions of the master cast. In addition, the denture base must be related to the removable partial denture framework in the same manners the basal seat tissues were related to the abutment teeth when the impression was made. **(Applegate, 1960 and Carr, 2011)**.

4-Design of partial denture framework: Knowledge of basic mechanical principles guides the management of functional forces in partially edentulous arches. Rotational forces passing through the most posterior clasp assemblies can be controlled using appropriate components. The most efficient method of controlling rotational movement is the use of one or more indirect retainers anterior to the fulcrum line. The indirect retainer is most often in the form of a rest attached to the major connector by a minor connector. If the distal extension denture is bilateral, one indirect retainer should be used on each side of the arch. If the distal extension base is unilateral retainer is positioned anterior to the fulcrum line and on the opposite side of the arch from the distal extension ridge. **(Applegate, 1960 and Stewart, 2014)**.

5-Total occlusal load applied: Patients with distal extension removable partial dentures generally orient the food bolus over natural teeth rather than prosthetic teeth. This is likely because of the more stable nature of the natural dentition, the proprioceptive feedback they provide for chewing, and the possible nociceptive feedback from the supporting mucosa. This has an effect on the direction and magnitude of the occlusal load to the removable partial denture, and thus on the load transferred to the abutments. Given this, the support from the residual ridge should be optimized and shared appropriately with the remaining natural dentition. **(Carr, 2011 and Stewart, 2014)**.

6-Type & Accuracy of impression registration: Distortion and tissue displacement by pressure may result from confinement of the impression material within the tray and from insufficient thickness of impression material between the tray and the tissues, as well as from the viscosity of the impression material; however, none of these factors is selective or physiologic in its action. These accidental distortions of the tissues occur because of faulty technique. Use of the anatomic form of the residual ridge in fabricating complete dentures is quite common because of a belief that this is the most physiologic form for support of the dentures. However, many other dentists believe that

certain regions of the residual ridge (s) in a partially edentulous patient are more capable of supporting dentures than other regions. Their impression methods are directed to place more stress on primary stress-bearing regions with specially constructed individual trays and at the same time record the anatomic form of other basal seat tissues, which cannot assume a stress-bearing role. **(Applegate, 1960 and Carr, 2011)**.

1.7-Impression:

An impression is defined as a plastic negative likeness of the teeth and/or edentulous areas where the teeth have been removed; which becomes relatively hard while in contact with these tissues. **(Carr, 2011)**.

1-Primary impression: Is an impression made for the purpose of diagnosis or for the construction of a tray. **(Abbe, 2005)**.

2. Secondary or final impression: An imprint that record the entire functional denture bearing area to ensure maximum support, retention and stability for the denture during use. The primary purpose of the final impression is to record accurately the tissues of the denture bearing sulcus areas, in addition to recording the functional width and depth of the sulcus. **(Carr, 2011)**.

1.8.Impression techniques:

1.8.1.Conventional technique:

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 imp. records the teeth and soft tissues in their anatomic form. The material of choice (soft or less viscous impression material) alginate. Disadvantages; In free-end saddle dentures will show tissue ward movement under occlusal load, which leads to ridge resorption. It is recommended for tooth

supported partial dentures Kennedy's class III and IV -These are bounded saddles. **(Carr, 2011 and Stewart, 2014)**.

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. **(Abbe, 2005).**

1.9.History of functional impression:

Applegate used impression wax to load functionally the residual ridge. Hindel felt that free-end denture base under masticatory load should be related to metal framework when it is seated. Holmes used four different materials with 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 residual ridge is not uniform. The need of functional impression arises in cases of distal extension based partial denture and with short span distal extension bases. Some mouth does not exhibit significant difference in anatomical and functional form of ridge. **(Stewart and Kuebker,2014)**. In some mouths, 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 or bases. 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. **(Brudvik, 1999 and Stewart, 2014).**

The functional impression technique is most 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. **(Applegate, 1960 and 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 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, 2011)**.

Materials used for functional impression are fluid waxes, metallic pastes, elastomeric impression materials and soft liners.

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

1.12.1. Physiologic impression technique:

1.12.1.(a) 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 and a 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 as shown **in fig (3). (Brudvik ,1999, Carr, 2011and Stewart, 2014)**.

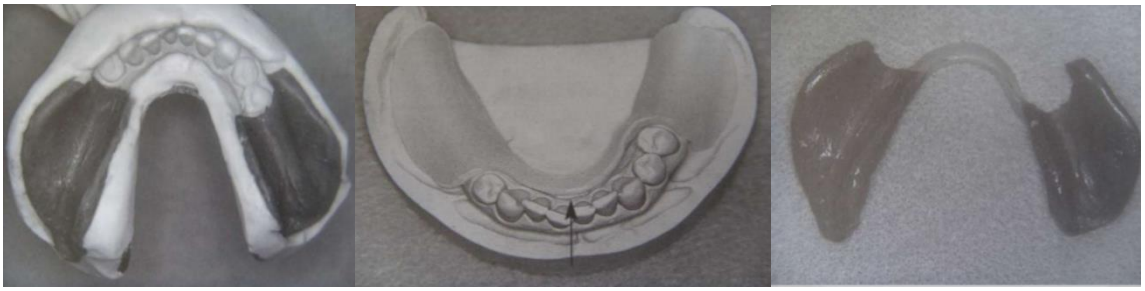

Fig 3: The McLean technique.

1.12.1.(b) 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 in **fig(4).**

Fig 4:Hindels modified stock tray. (**Hindels, 2001).**

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. 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 the 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 occlusally 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 and Stewart, 2014)**.

1.12.1.(c) 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. **(Stewart, 2014)**.

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 provide.

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 in **fig (5).**

Fig 5:functional relining method. **(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. **(Leupold et al 2014)**.

1.12.1.(d) 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)**.

Applegate in 1960 stated that recording non-pressure bearing areas in their anatomic form. 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 calls for a water bath maintained at 51°C to 54 °C (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. **(Carr et al., 2004).**

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 fluid wax impression technique can produce an accurate impression if the technique is properly executed. The procedure is time consuming, but if the time periods are not followed accurately, an impression with excessive tissue displacement will result. **(Brudvik, 1999 Stewart, 2014).**

1.12.2. 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. **(Aziz et al., 2021).**

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. **(Aziz et al., 2021).**

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 (s) 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. **(Aziz et al., 2021).**

1.13.Altered Cast Technique:

For preservation of the residual ridge, Becker and his colleagues critically reviewed the evolution of removable partial denture and outlined six principles for its design which include a rigid major connector, multiple positive rest seats, mesial rests, parallel guiding planes, the I-bar clasp design and the altered cast technique. **(Niarchou et al., 2011)**.

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. **(Patil, 2011)**. 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. **(Patil, 2011 and Stewart,2014).** as shown **in fig (6).**

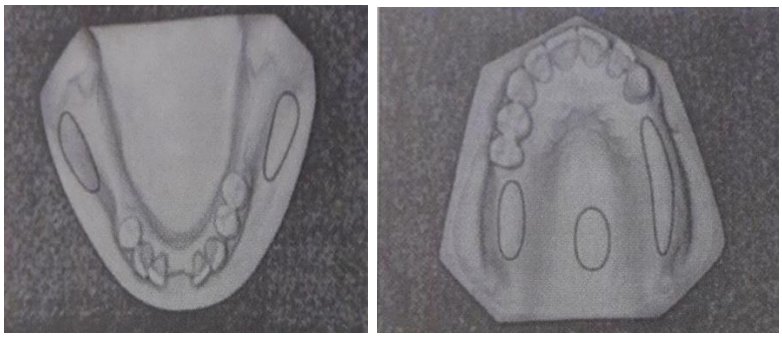

Fig 6:Maxilary and Mandibular stress bearing areas**. (Patil, 2011).**

With the use of an altered cast impression, the clinician need not be overly concerned with the accuracy of the edentulous areas and call concentrate. 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. **(Sayed and Jain, 2019).**

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 intcrocclusal 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. **(Sayed and Jain, 2019).**

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. (**Vanzeveren et al., 2003).**

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. **(Hsu, 2014).**

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 and Kuebker, 2014).**

This technique has the potential benefits of reducing the number of postoperative visits **(Chandrashekar Sajjan, 2010)**, preserving the residual ridges, improving stress distribution, decreasing food impaction and decreasing the torqueing of abutment teeth leading to increased patient satisfaction. **(Vanzeveren et al., 2003).**

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. **(Denis and Josip, 2013).**

Fabricating a tray on the framework requires elimination of undercuts with wax on the cast to prevent the tray material from locking onto the cast. Excessive block-out material may cause incomplete seating of the framework and will affect the accuracy of the impression. The use of acrylic resin or composite resin at the framework evaluation appointment also requires additional time and effort. Use of polyvinyl siloxane material for an altered cast impression tray, which is sufficiently stiff to serve the impression tray on the framework and circumvents the need for elimination of undercuts with wax on the definitive cast. **(Vaibhav et al., 2020).**

Fabricating a partial removable dental prosthesis usually requires 3 separate visits to evaluate the framework, altered cast impression, and maxillomandibular relationship record. An alternative technique for accomplishing each of these procedures in a single appointment with computer-aided design/computer-aided manufacturing (CAD/CAM) and rapid prototyping (RP) technologies. With CAD/CAM/RP technologies, the 1-piece

stereo-lithographic resin structure is used for making the framework evaluation, altered cast impression, and maxillomandibular relationship record in a single appointment.

The number of patient visits, chair time, and laboratory procedures are reduced with this technique. **(Ju-Hyoung, 2015).**

When a polyurethane cast is used to fabricate a partial removable dental prosthesis, a layer of tinfoil is placed on the edentulous area to prevent chemical bonding between the cast and heat polymerizing resin during processing. **(Wu, Li, and Zhang, 2017).**

Even though the soft tissue morphology is accurately reproduced in the polyurethane cast with a digital scanner and rapid prototyping machine, tinfoil easily crumples on the cast, resulting in a rough denture base and occlusal error. Introduces an altered polyurethane cast to overcome these limitations and facilitate separation from the cast after processing. **(Cho and Suh, 2017).**

CHAPTER

TWO

CONCLUSION

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Within the limitations of this study, the following conclusions were made:

1- A favorably extended base will provide stimulation to the underlying bone and distribute forces uniformly.

2- The altered cast technique allows the ridge, recorded in functional form, to be related to the teeth so that when the prosthesis is seated, it derives support simultaneously from the teeth and the denture base.

3- Altered cast impression technique is commonly used for the mandibular distal extension partially edentulous arches (Kennedy Class I and Class II). This technique is not common to be used in maxillary arches because the nature of the masticatory mucosa and the amount of form tissue support.

CHAPTER

THREE

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