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The Altered Cast Technique

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The College of Dentistry, University of Baghdad, Department of Prosthodontics

in Partial Fulfillment of requirement for the Bachelor degree of Dental Surgery

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صدق الله العظيم

Certification of the Supervisor

I certify that this project entitled " **The Altered Cast Technique** " was prepared by the fifth-year student **Mohammed Ghassan Mohammed** under my supervision at the College of Dentistry/University of Baghdad in partial fulfilment of the graduation requirements for the Bachelor Degree in Dentistry.

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DEDICATION

All my success as well as everything I do, I’m honored to dedicate it to my parents, the two people who gave me the values and paved the path for my journey in life. A special feeling of gratitude to my loving parents, whose words of encouragement and push for tenacity ring in my ears.

My father's soul, who pushed me to continue for the better and accompanied me throughout this difficult period and who has always been my inspiration in my work.

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My sisters have never left my side and are very special.

My grandparents for believing in me since day one and granting me the gift of compassion and motivation.

I also dedicate this dissertation to my many friends and family who have supported me throughout the process. I will always appreciate all they have done. for their presence, warmth and endless support.

I dedicate this work and give special thanks to my best friend Mustafa for being there for me. You have been my best cheerleaders.

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List of abbreviations

RPD	**Removable partial denture**
ACP	**American college of prosthodontics**
RPI	**Rest ,proximal plate and I_bar clasp**
RPA	**Rest ,proximal plate and Akers clasp**
Fig	**Figure**

INTODUCTION

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 removable partial dentures have an advantage of presence of a direct retainer whereas this is lacking in the prosthesis fabricated over distal extension bases **(Rashid *et al*.,2018).**

It is mainly the stability of the denture that is limited by the ridge conditions. Stability is the quality of a removable prosthesis to be firm, steady, or constant to resist displacement by functional horizontal or rotational stresses **(Limpuangthip *et al*., 2019).**

Denture retention was defined as the resistance to vertical pulling force, while denture stability was the *resistance* to horizontal forces **(Limpuangthip *et al*., 2019).**

Fabrication of distal extension partial dentures most commonly use alter cast impression technique because it equally distributes stress between soft and hard tissues, reduce the load on the abutment teeth, decrease food impaction and preserve the residual ridges, leading to increased patient satisfaction**(Singh *et al*.,2020).**

An altered cast impression procedure to improve the support of distal extension removable partial dentures is widely taught. Also known as the corrected-cast technique. 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. Other benefits include reduction of the number of post-operative

visits, preservation of the residual ridges and decreasing the food impaction**(Rashid *et al*.,2018).**

The soft tissue is recorded as it functions and then the distal edentulous area of the cast is replaced with a new impression and the cast is poured **(Baloch *et al*., 2014) .**

Aims of the Review:

The Review aim to:

1-Explain the procedures of impressions for free end saddle.

2-Clarify the difference between functional and anatomical impressions.

3-Determine which type of impressions is better to record the ridge in function in free end saddle.

CHAPTER ONE

REVIEW OF LITERATURE

1.1 Partial edentulism

Partial edentulousness is a dental arch in which one or more but not all natural teeth are missing. Generally, it occurs by caries, periodontal problems, traumatic injuries, impactions, supernumerary teeth, neoplastic and cystic lesions **(Abdl-Rahman *et al*., 2013).**

Partial edentulism leads to several drawbacks to the subjects including clinical challenges and lifestyle compromises. Clinically, partial edentulism results in drifting and tilting of adjacent teeth, supra eruption of opposing teeth, altered speech, changes in facial appearance and tempero-mandibular disorders **(Zaigham and Muneer , 2010).**

Also, the loss and continuing degradation of the alveolar bone, the adjacent teeth and also the supporting structures will influence the difficulty to achieve an adequate restoration in a partially edentulous patient. On the lifestyle compromises, partial edentulism restricts dietary options, which leads to weight loss. Further, it leads to lack of confidence and confined social activities, which may adversely affect the quality of life and lead to psychological dissatisfaction **(Muneeb ,2013).**

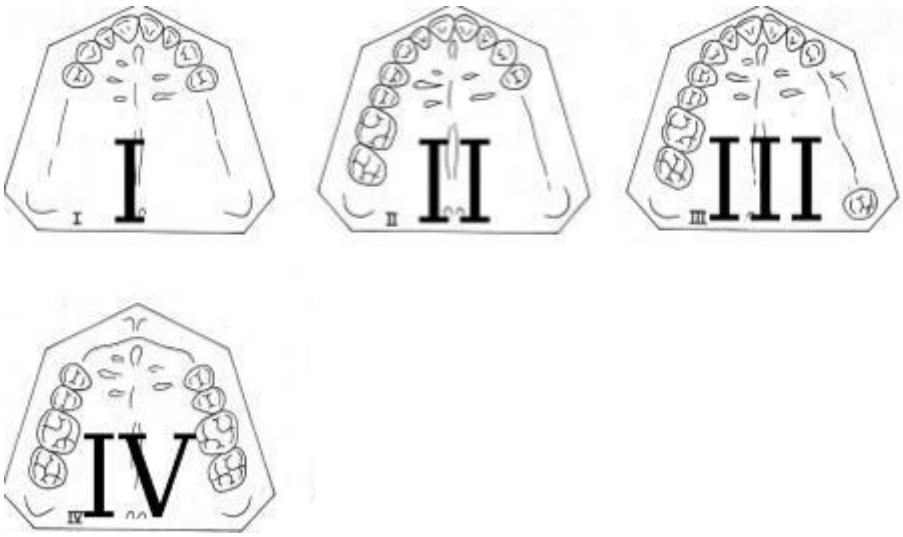
1.1.1 Classification of partial edentulism

Partially edentulous arches have been Classified by various methods. The possible combinations of partial edentulism are more than 65,000 depending on their incidence in maxillary and mandibular arches. The primary objective of the classification is to facilitate the communication about the combination of missing teeth to edentulous ridges among students, dental practitioners and laboratory technicians. Among the various methods of classification like Kennedy, Applegates, Avant, Neurohar, Eichner, ACP (American College of

Prosthodontics) etc, Kennedy's classification is widely studied and clinically accepted by Dental Community. As per Kennedy's classification, there are four main types of partially edentulous arches as Class I, Class II, Class III and Class IV**(McGarry *et al*.,2002)**.

This system is developed by Dr. Edward Kennedy in 1923 for classification of edentulous jaw conditions and partial dentures based on the distribution of edentulous spaces fig (1-1):

- **Class I is bilateral free-end saddles.**
- **Class II is a unilateral free-end saddle.**
- **Class III is a unilateral single bounded saddle.**
- **Class IV is a single bilateral anterior bounded saddle. (McGarry *et al*. ,2002).**



Figure(1-1): Kennedy classification.(Bauer.2012).

1.1.2 Distal Extension Removable Partial Denture

a saddle is the tooth-bearing part of the denture. Class I & Class II are termed free end saddle when the distal teeth of one or both end of the arch is missing and the denture is tooth-tissue supported, it become free end saddle**(Turpin,2011).**

The distal extension removable partial denture does not have the advantage of total tooth support because one or more bases are extensions covering the residual ridge distal to the last abutment. It therefore is dependent on the residual ridge for a portion of its support.

The tooth-supported base is secured at either end by the action of a direct retainer and is supported at either end by a rest, whereas this degree of support and direct retention is lacking in the distal extension prosthesis **(Carr and Brown,2016)**.

1.1.3 Problems of Free End Saddle

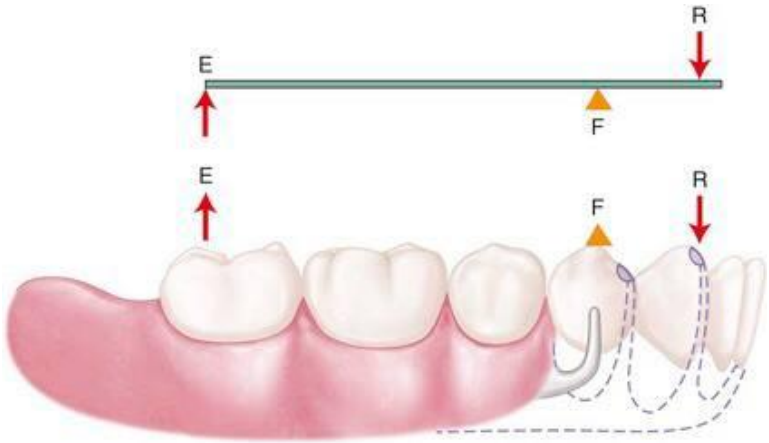
One of greatest challenges of dentists is the rehabilitation of free-end Kennedy class I and class II patients due to the improper occurrence of stress around the supporting structures of conventional removable dentures during mastication.One of the most common problems of this type of dentures is the displacement of tissue, tissueward movement of the free-end saddle of a removable partial denture during function takes place around the most distal fulcrum created by the most mesial rests. fig(1-2) **(Silveira *et al*.,2018).**

Displacement because of sticky foods takes place around the fulcrum created by the most distal rests. These and other factors affecting displacement of the free-end saddle removable partial dentures are discussed, and designs intended to increase retention are presented. Stress on the terminal abutment can be reduced by the use of an extracoronal resilient attachment that allocates more loads onto

the distal edentulous ridge. The level of loading influenced the extent of reduction. A resilient attachment with a universal hinge had the most movement when loading was in the buccolingual direction **(Wang *et al*.,2011).**

In cases where retention is not optimal, the free end saddle has a tendency to drift and rotate around the abutment causing discomfort and potentially injuring soft tissues. There is an evidence to suggest that 20% of free end saddle partial denture wearers are dissatisfied due to comfort and functional problems and in some cases this has led to dentures disuse over prolonged periods **(Shaban *et al*.,2020).**

The mandibular denture is usually more problematic than the maxillary denture owing to the smaller surface area coverage of the foundation tissues. The problem of retention and stability is more pronounced with mandibular denture as compared to the maxillary denture because the covered surface area is approximately half to that in the maxillary arch, and the presence of palate adding to the area against the mobile tongue on the floor of the mouth in the mandibular arch **(Jain and Rathee,2022).**



Figure(1-2): Lever action in free end saddle (Carr and Brown,2016).

1.2 Support and Retention of a Distal Extension Base

A mucosa-borne denture is the conventional treatment modality adopted most commonly for edentulous patients. The patient's acceptance of the finished prosthesis is dependent on various factors, among which retention and stability of the denture play a significant role. The loose and unstable denture is a persistent source of annoyance to the patient and the dentist**(Jain and Rathee.2022).**

Denture retention and stability were considered as acceptable when the denture resisted displacement from a vertical pull and had slight/no rocking on horizontal movement; otherwise, it was considered as unacceptable **(Limpuangthip *et al*., 2019)**.

1.2.1 Support in free end saddle:

A systematic approach starts with a correct diagnosis of the remaining hard and soft tissues, followed by a careful planning of support, stability and retention in that order. Additional elements should be added only at a later stage. A systematic track starting with a preliminary design, surveying of the model and analyzing the preliminary design on that surveyed model. If needed, that track should be reversed until an acceptable design is found. Support should ideally be achieved by using metal rests on healthy tooth structure. Tooth supported removable partial denture are the most convenient ones and have a very good long-term prognosis **(Samet and Shohat,2003)** .

Old restorations or caries might impose changes from the ideal supporting rests. When posterior teeth are missing or when the edentulous area is vast, tooth-tissue supported removable partial dentures are used. In these cases one should gain initial support from the teeth and an additional support from the soft tissues. A denture base that is similar to a full denture base that would have

been prepared for a fully edentulous patient should achieve this. If the prognosis of the potential supporting teeth is poor, a tissue-tooth supported removable partial denture is considered. In these cases, the denture base is the primary supporting element, and stress relieving clasp-assemblies such as the RPI/RPA should be considered. Stability is achieved primarily by metal contacts between teeth and the metal framework of the removable partial denture . In fact, any embracing part of the clasp assembly and a correct denture base can contribute to the stability. The distal parts of the retentive clasps produce the active retention. Since these parts generate lateral forces on the abutment teeth, a reciprocating element should be used **(Samet and Shohat,2003)** .

True reciprocation can only be achieved if the reciprocating element touches the tooth before the retentive clasp. After designing support, stability and retention, other parts should be considered. When a distal extension removable partial denture is considered, an indirect retainer should be incorporated into the framework in order to prevent upward rotational movement of the denture. The major connector converts forces from one side to the other. If removable partial dentures are the chosen solution, start designing with analysis of support, followed by stability and only then, decide upon the necessary retentive elements. All other parts should be considered later. Such a systematic approach will ensure a long-term solution and a happy patient **(Samet and Shohat,2003)** .Because one of the stated objectives of prosthodontic treatment is the restoration of function and comfort in an esthetically pleasing manner, maintenance of occlusal contact in distal extension removable partial dentures

demands an understanding of the factors that influence residual ridges fig(1-3)

(Carr and Brown.,2016).

Figure(1-3):Position of the rest.(El-sharkawy,2023).

1.2.2 Retention in free end saddle:

Is the quality of a denture that resists movement away from the tissue.

The patient should be able to eat comfortably and with minimal movement of the denture relative to its foundation area. The retentive dentures can be fabricated in the majority of the patients regardless of the condition of the ridge. if the patient does require a removable partial denture; maximum retention can be achieved by using a tooth and mucosa borne denture design including an RPI system (mesial rest, distolingual guide plate, I-bar) and indirect retention where applicable **(Quiney *et al*.,2017).**

Factors Influencing the retention:

1) Anatomical factors.

2) Physical factors.

3) Mechanical factors.

4) Muscular factors. 5) Surgical factor **(Darvell and Clark,2000).**

1.3 Factors Influencing the Support of a Distal Extension Base:

1.3.1 Contour and Quality of the Residual Ridge:

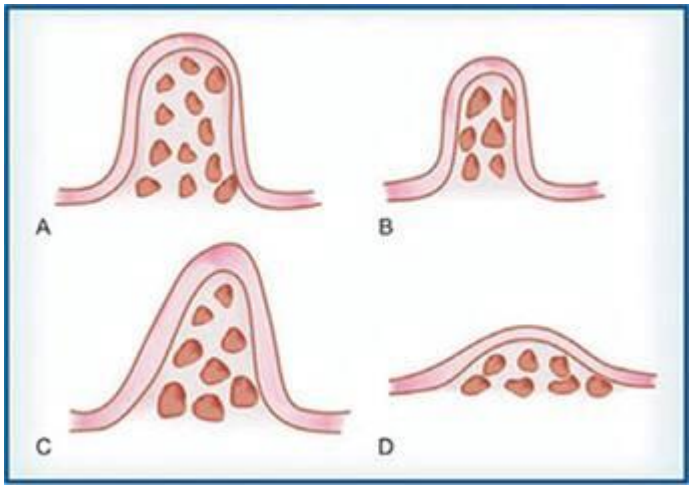
The ideal residual ridge to support a denture base would consist of cortical bone that covers relatively dense cancellous bone, with a broad rounded crest with high vertical slopes, and is covered by firm, dense, fibrous connective tissue. Such a residual ridge would optimally support vertical and horizontal stresses placed on it by denture bases. Unfortunately this ideal is seldom encountered. Easily displaceable tissue will not adequately support a denture base, and tissues that are interposed between a sharp, bony residual ridge and a denture base will not 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 fig(1-4) **(Carr and Brown.,2016).**

The buccal shelf region (bounded by the external oblique line and the crest of the alveolar ridge) is considered as a primary stress-bearing area, because it is covered by relatively firm, dense, fibrous connective tissue supported by cortical bone. In most instances this region bears more of a horizontal relationship to vertical forces than do other regions of the residual ridge**.**The slopes of the lower residual ridge would become the primary stress-bearing region for resistance of horizontal and off-vertical forces **(Nabeel,2021)**.

The crest of the mandibular residual ridge cannot be a primary stress-bearing region, as the bony mandibular residual ridge is most often cancellous and the lining mucosa is not firmly attached to the residual ridge. The crestal area of the maxillary residual ridge will become stress-bearing area for vertically directed

forces. Some resistance to these forces may be obtained by the immediate buccal and lingual slopes of the ridge **(Nabeel,2021).**

Palatal tissues between the medial palatal raphe and the lingual slope of the posterior edentulous ridge are readily displaceable and cannot be considered as primary stress-bearing sites. The tissues covering the crest of the maxillary residual ridge must be less displaceable than the tissues that cover palatal areas, or relief of palatal tissues must be provided in the denture bases or for palatal major connectors **(Nabeel,2021)**.



Figure(1-4):Residual Ridge Form (Sarandha,2007).

1.3.2 Extent of residual ridge coverage by the denture base:

The broader the residual ridge coverage, the greater is the distribution of the load, which results in less load per unit area .A denture base should cover as much of the residual ridge as possible and should be extended the maximum amount within the physiologic tolerance of the limiting border structures or tissues. Knowledge of these border tissues and the structures that influence their movement is paramount to the development of broad coverage denture bases **(Carr and Brown,2016).**

The Removable partial denture derives its support from the residual ridge with its fibrous connective tissue covering. The length and contour of residual ridge significantly influence the amount of available support and stability **(Jameel,2020)**.

1.3.3 Accuracy of the Fit of the Denture Base:

Support of the distal extension base is enhanced by intimacy of contact of the tissue surface of the base and the tissues that cover 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 manner as the basal seat tissues were related to the abutment teeth when the impression was made. Every precaution must be taken to ensure this relationship when the altered cast technique of making a master cast is used **(Carr and Brown,2016).**

1.3.4 Design of the Removable Partial Denture Framework:

When planning treatment for partially edentulous patients, the dentist is confronted with combinations of edentulous spaces and remaining teeth, so designing a removable partial denture framework might be complicated for students and dentists. This problem seems to arise not so much from a lack of understanding of basic concepts, but from the lack of a start point and a systematic sequence of designing. This simple and systematic designing procedure consists of six major steps, that must be remembered and followed in this manner:**(Mosharraf,2008).**

1. rests.
2. minor connectors and proximal plates.
3. retentive meshwork.
4. major connector.

5. direct retainers.
6. indirect retainers.

In each step, there are 2-3 rules that must be considered **(Mosharraf,2008).**

The greatest movement takes place at the most posterior extent of the denture base, the retromolar pad region of the mandibular residual ridge and the tuberosity region of the maxillary residual ridge therefore are subjected to the greatest movement of the denture base

use of more anterior or mesial rest is suggested as it allow vertical ridge loading,Permit greater ridge area for support, transfer stress to anterior abutment fig(1-5).

Incorporation of indirect retainer. Incorporation of RPI system in free end suddle which make stress release **(Jameel,2020).**

Figure(1-5): Metal framework with mesial rest designed to eliminate separate minor connector(Shifman and Ben-Ur,2000).

1.3.5 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 due to the more stable nature of the natural dentition, the proprioceptive feedback it provides for chewing, and the possible nociceptive feedback from the supporting mucosa. The number of artificial teeth, the width of their occlusal surfaces, and their occlusal efficiency influence the total occlusal load applied to the removable partial denture **(Carr and Brown,2016).**

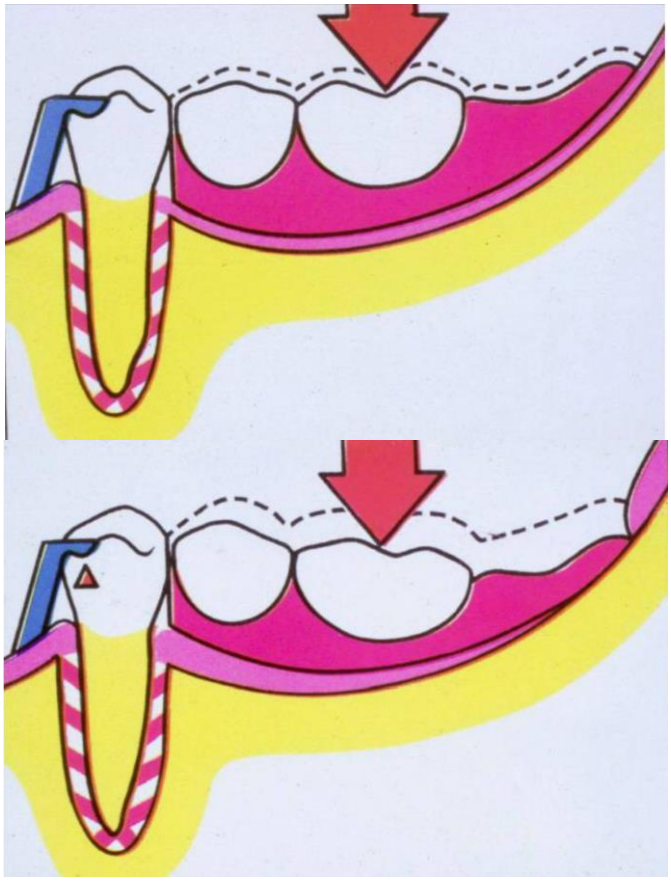
The reduction of the size of the occlusal table reduces the vertical and horizontal forces that act on the removable partial dentures and lessens the stress on the abutment teeth and supporting tissue **(Jameel,2020).**

1.3.6 Type and accuracy of the impression registration:

The residual ridge may be said to have two forms: the anatomic form and the functional form, fig (1-6). The anatomic form is the surface contour of the ridge when it is not supporting an occlusal load. The functional form of the residual ridge is the surface contour of the ridge when it is supporting a functional load. The anatomic form is recorded by a soft impression material, such as a metallic oxide impression paste, if the entire impression tray is uniformly relieved. Depending on the viscosity of the particular impression material used and the rigidity of the impression tray, it is also the form that can be recorded by mercaptan rubber, silicone, and hydrocolloid impression materials **(Carr and Brown,2016).**

The form of the residual ridge recorded under some loading, whether by occlusal loading, finger loading, specially designed individual trays, or the consistency of the recording medium, is called the functional form. This is the surface contour of the ridge when it is supporting a functional load. How much

it differs from the anatomic form depends on the thickness and structural characteristics of the soft tissues overlying the residual bone. It will also differ from the anatomic form in proportion to the total load applied to the denture base. Of the two philosophies, the latter seems to be more logical. Any method, whether it records the functional relationship of the ridge to the remainder of the arch, or the functional form of the ridge itself, may provide acceptable support for the removable partial denture. On the other hand, those who use the anatomic ridge form for the removable partial denture should seriously consider the need for some mechanical stress-breaker to avoid the possible cantilever action of the distal extension base against the abutment teeth **(Carr and Brown,2016).**



Figure(1-6):Anatomic and functional form of impression (Kaddah,2019).

1.4 Impression techniques for partial edentulism.

An impression is a negative imprint of the teeth and surrounding tissues that is used to create a mold or cast of the oral structure. This procedure provides a tridimensional and accurate mouth replica, allowing dental work even in the absence of the patient **(Gupta and Brizuela,2022).**

Dental models enable dentists to perform a better diagnosis and treatment planning since the teeth can be meticulously visualized and studied from angles that are difficult to see in the patient's mouth. Particular treatment, such as removable and fixed prostheses, can be executed thanks to dental casts. The final restoration or prosthesis fit depends on how accurately the impression material has recorded the tissue details **(Gupta and Brizuela,2022).**

1.4.1 Anatomic and Functional Form Impressions.

The anatomical form of impressions refers to the physical shape and structure of the body or a specific body part. In dentistry, anatomical form is often referred to in relation to the teeth and jaw. Dentists may take impressions of a patient's teeth and jaw to create a mold or model of their anatomy. This can be used to diagnose problems, plan and carry out treatments, or make dental prosthetics such as dentures. Functional impressions refer to how the body or specific body parts work and perform their intended functions. This includes the physical and physiological processes involved in movement, sensation, and communication within the body. Both impressions are used together to fabricate the denture. The greatest challenge is to fabricate a denture using both these impressions **(Nallaswamy *et al*.,2003).**

1.4.1.1 Anatomic Form Impressions

The anatomic form impression is a one-stage impression method using an elastic impression material that will produce a cast that does not represent a functional relationship between the various supporting structures of the partially edentulous mouth. It will represent only the hard and soft tissues at rest. With the removable partial denture in position in the dental arch, the occlusal rest(s) will fit the rest seat(s) of the abutment teeth, whereas the denture base(s) will fit the surface of the mucosa at rest **(Carr and Brown,2016).**

It is obvious that the soft tissues that cover the ridge cannot by themselves carry any load applied to them. They act as a protective padding for the bone, which in the final analysis is the structure that receives and resists the masticatory load. Distribution of this load over a maximum area of bone is a prime requisite in preventing trauma both to the tissues of the extension base areas and to the abutment teeth **(Carr and Brown,2016).**

A removable partial denture fabricated from a one-stage impression, which records only the anatomic form of basal seat tissues, places more of the masticatory load on the abutment teeth and that part of the bone that underlies the distal end of the extension base. The balance of the bony ridge will not function in carrying its share of the load. The result will be a traumatic load to the bone underlying the distal end of the base and to the abutment tooth, which in turn can result in bone loss and loosening of the abutment tooth **(Carr and Brown,2016).**

1.4.1.2 Functional Form Impressions

It means the shape of the residual ridge tissue when it is functioning to support the denture base .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 and Brown,2016).**

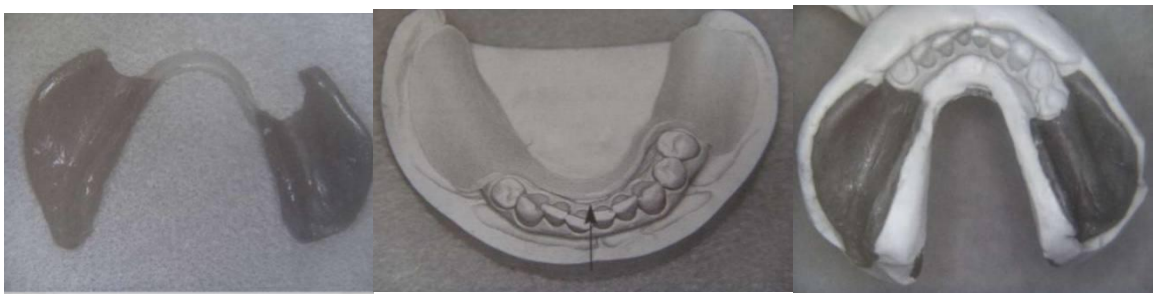
When the residual ridge mucosa demonstrates a uniformly firm consistency, an impression technique that involves capturing the tissue form while the patient is in occlusion can be considered. Such a technique records the mucosal position and shape under the influence of a static closure force, similar to functional masticatory forces. The more the mucosa displaces under function, the more rebound there is likely to be. Because the prosthesis will be under occlusal load for only a portion of a day, minimal rebound is desired so as to maintain the clasp assembly–tooth relationship **(Carr and Brown,2016).**

1.4.2 Physiologic Impression Techniques

1.4.2.1 McLEAN'S Physiologic Impression:

The need for physiologic impressions was first proposed by McLean. He realized the need for recording the tissues of the residual ridge in a functional form while capturing the remaining teeth in the anatomic form. To accomplish their objectives, they constructed a custom tray on a diagnostic cast. Spacer is not adapted. A functional impression was made using custom tray and a suitable impression material. A hydrocolloid "over-impression" was then made while

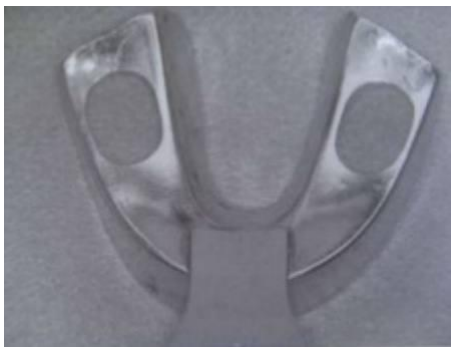
maintaining the functional impression in its intended position. The greatest weakness of the technique was that practitioners could not produce the same functional displacement generated by occlusal forces **(Hyun-Suk Choi and Jin-Hyun Cho ,2017).**



Figure(1-7):The McLean technique (Boulos and Daou,2016).

1.4.2.2 Hindel's Method:

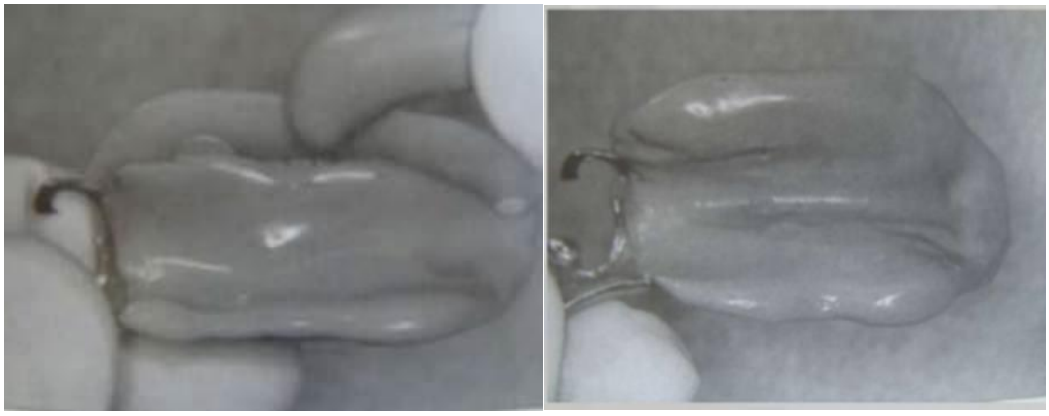
In response to the shortcomings in McLean's technique, Hindel and others modified the impression procedure which recorded the tissues under rest. They also developed modified impression trays for the second impression procedure. These trays had large holes in their posterior segments. As a result, the 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 masticating forces were taking place on the denture base. Hindel's technique records the residual ridge in its normal or rest state, but is related to the anatomic structures like teeth in a functional form **(Jain *et al*.,2017).**



Figure(1-8):Handel's modified stock tray (Boulos and Daou.2016).

1.4.2.3 Functional Reline Method:

It 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. 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(Soft metal spacer).An impression is made with a free-flowing zinc oxide-eugenol paste or a light-bodied elastomers. 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 **(Phoenix *et al*.,2008).**



Figure(1-9):functional relining method. (Boulos and Daou.2016).

1.4.2.4 Fluid Wax Functional Impression:

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, to record the stress-bearing areas of the ridge in their functional form, and to record non-pressure-bearing areas in their anatomic form **(Jain *et al*.,2017).**

Disadvantage:

1. Time consuming

2. Impression with increased tissue displacement if time period not followed **(Jain *et al*.,2017).**

1.4.2.5 Selected Pressure Impression:

This technique attempts to direct more force to those position of the ridge able to absorb the stress without adverse response and to protect the areas of the ridge least able to absorb force. Stress bearing areas are the buccal shelf area and the lingual slopes of residual ridge stress bearing areas **(Jain *et al*.,2017).**

1.5 Altered Cast Technique

The altered cast impression technique is commonly used for the mandibular distal extension partially edentulous arches. The technique is relatively simple and improves the residual ridge to dentition relationship of the prosthesis. Due to the displaceability of the mucosa, free end saddles get displaced under occlusal load **(Singh *et al*.,2020).**

The altered cast technique is employed to try and prevent this by making an impression of the mucosa under controlled pressure. The metal framework was constructed on a cast produced by a mucostatic impression material. Base plates were then constructed in self-cured acrylics on the framework in the saddle areas, and these are close fitting **(Sajjan,2010).**

Altered cast technique is the best alternative technique in case of distal extension cases because better tissue adaptability, proper extension of denture base, equal stress distribution, better support and stability can be achieved. Finally, increased patient comfort and function is obtained **(Singh *et al*.,2020).**

Cast partial denture made using altered cast technique creates an environment on which the teeth and the edentulous tissues support the bases as compatible as possible, resulting in a more stable removable partial denture **(Sunil *et al*.,2014).**

In the altered cast procedure, the denture framework is fabricated on a one-piece cast and used as the base for a relieved individual tray which is then used to make a second impression of the edentulous tissues. Since the metal framework can be stabilized on the teeth while the impression is made, the mucosal tissues are in as nearly a state of rest as possible. The second impression is used to alter the cast in order to reproduce in the new registration, the relationship between

the edentulous and the dentulous regions. Then, the altered cast is used to form the basal surfaces of the denture bases **(Jain *et al*.,2017).**

This technique is not commonly used in maxillary arches because of the nature of the masticatory mucosa and the form of tissue support. Since retention and stability has inherent problem of the distal extension removable partial denture and displaceability of the mucosa of the free end saddle are displaced under occlusal pressure, these problems can be overcome by altered cast technique **(Singh *et al*.,2020).**

Well- designed removable partial denture with altered cast technique can be an excellent treatment alternative to implants and fixed prosthesis **(Singh *et al*.,2020).**

1.5.1 The procedure of altered cast technique:

1. Diagnostic impressions were made with irreversible hydrocolloid impression material and poured with Type II dental stone.
2. The study casts were placed on a surveyor examination and design of the cast metal framework. Mouth preparation was done (fig. 1-10a).
3. Final impression was made with addition silicone and light bodied elastomer impression material (fig. 1-10b) to record details of the tooth preparation.
4. Master casts were poured (fig. 1-10c).

5. The cast was placed on a surveyor for examination and design of the cast metal framework (fig.1-10d).

A

B

C

D

6. It was then sent to laboratory for fabrication of metal framework. The occlusion rims were fabricated after checking the fit of the framework in the cast. The cast metal framework with occlusion rims was tried intra-orally for accuracy of fit.(fig.1-10e)
7. Border molding was carried out in the usual fashion for the desired extension with green stick compound and secondary impression was made with zinc oxide eugenol paste (fig.1-10f), the fit of the metal framework to the teeth and soft tissues was checked during border moulding and secondary impression.
8. After that the cast was altered in the laboratory. Two saw cuts were made perpendicular to each other in master cast: A) The first cut was made 0.5 mm to 1.0 mm distal to the most distal tooth and perpendicular to the edentulous ridge. This cut was carried from the outer edge of the cast to 6.0 to 7.0 mm medial to the lingual vestibule. B)The second cut was

made parallel and medial to the edentulous ridge, extending from the most posterior aspect of the cast to the most medial aspect of the first cut.(fig.1-10g).

9. In the cut surface of the cast, grooves were placed to aid in the retention of the newly poured stone. Complete seating of the framework on the cast was ensured before it was fixed in place with sticky wax.
10. The final impression was beaded and boxed (fig.1-10h) and the cast was poured with dental stone.

<table>
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H</td></tr>
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11. Finally altered master cast was obtained (fig.1-10i).
12. Checked for metal framework in altered master cast (fig.1-10j).
13. Bite registration, articulation (fig.1-10k), try in and denture fabrication were carried out in usual manner. **(Singh *et al*.,2020).**

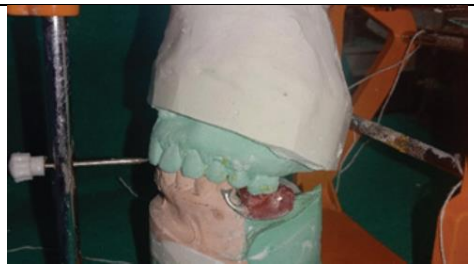
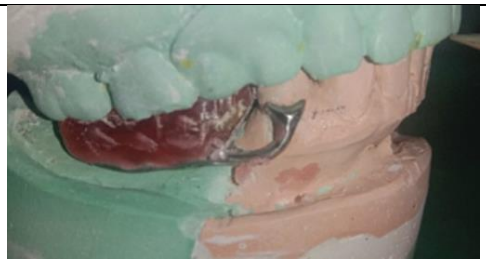
 **I**	 **J**
 **K**	 **K**

Figure (1-10) The procedure of altered cast technique :a)Intra oral view after mouth preparation, b) Impression after mouth preparation, c) Master cast after mouth preparation, d) RPD designing in master cast, e) Metal framework with occlusion rim checked intra orally, f) Final impression with zinc oxide eugenol paste, g) Casts with two saw cuts perpendicular to each other, h) Beading and boxing done, i) Corrected cast obtained, j) Corrected cast with metal framework, k): Articulation (Right view), k) Articulation (Left view) (Singh *et al*.,2020).

1.5.2 The benefits of an altered cast technique.

Altered cast impression technique not only allow the physiological/ functional record of the edentulous ridge but can be used to correct a laboratory errors of over trimmed master cast **(Mostafa *et al*.,2021).**

Cast partial denture made using the altered cast impression technique helps create an environment in which the teeth and the edentulous tissues support the base as compatibly as possible **(Sajjan,2010).**

This technique has the potential benefits of reducing the number of postoperative visits, preserving the residual ridges, improving stress distribution, decreasing food impaction and decreasing the torquing of abutment teeth. All of which lead to increased patient satisfaction **(Sajjan,2010).**

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 **(Sajjan,2010).**

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 retromolarpad and buccal shelf by the base **(Mostafa *et al*.,2021).**

CHAPTER TWO

CONCLUSION

From this Review, we conclude the following:

1. The objectives of the altered cast technique are to obtain the maximum possible support from the distal extension base of the Removable partial denture and to accurately relate the soft tissue surface of the denture base to the metal framework, but requires increased chair-side time and laboratory cost but requires less chair- side time and laboratory cost compared to implant supported prosthesis.
2. Using altered cast technique, properly extended denture base stimulates underlying bone, distributes force uniformly and derives support 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 I). 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.
4. Altered cast impression technique not only allows the physiological/ functional record of the edentulous ridge but can be used to correct a laboratory error of over trimmed master cast.

CHAPTER THREE

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