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Impression Techniques for Class I or Semi complete Denture

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Abstract **Review Article**

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

Keywords: Impression materials, Impression technique, Semi complete edentulous patient, Class I Denture, Functional Impression Technique.

INTRODUCTION

Artificial substitutes are used to replace and restore teeth as part of removable prosthodontic treatment. Adult patients who are partially dentate and wear removable partial dentures (RPDs) are becoming increasingly common. The purpose of the treatment is to prevent rehabilitation. Treatment with removable prosthodontics can provide remarkable satisfaction for the patient and dentist. As prosthodontics evolved, the trend toward removable partial dentures altered throughout time. These modifications included shifts in impression procedures. The foundation of a good removable partial denture is the impression method. However, because the prosthesis is supported by two distinct tissues the teeth and the mucosa building a removable partial denture in distal extension situations is a difficult process. The prosthesis may become unstable because of these supporting tissues' varying degrees of resilience. In situations involving distal extension, where managing the disparity in resiliency in the supporting tissues presents a challenge, many methods have been put forth for the fabrication of detachable partial dentures. Thus, it is necessary to record the residual ridge in functional form and the remaining natural teeth in anatomic form at distal extension bases [1].

Kennedy Classification System

The most widely used method for classification of partially edentulous dental arches was proposed by Dr Edward Kennedy in 1925. 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. Class I arch, characterized by bilateral edentulous areas located posterior to the remaining natural teeth. Class II arch, displays a unilateral edentulous area located posterior to the remaining natural teeth. Class III arch presents a unilateral edentulous area with natural 5 teeth both anterior and posterior to it. 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 (VanBlarcom, 1994). Each Kennedy classification, except Class I, refers to a single edentulous area. 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) [2]

Class I Removable Partial Dentures

Removable partial dentures must distribute stress evenly in order to protect the remaining teeth and residual ridges. Concentrating stress on the existing teeth could result in possible abutment loss and the quick deterioration of periodontal tissues. When stresses are concentrated on the remaining ridges, the related tissues may be rapidly destroyed, resulting in a reduction in ridge height. As a result, professionals need to carefully analyze how the design of a removable partial denture

may affect the remaining oral structures. Class I removable partial dentures must be designed with the following characteristics:
flexible direct retention, indirect retention, and maximum support for the distal extension denture bases supplied [2].

Optimum Support for Distal Extension Denture Bases

A properly fitted denture base should cover all of a residual ridge's areas that can support the ridge. A beneficial distribution of stresses, sometimes referred to as the "snowshoe effect," is made possible by broad coverage. Stress concentration, underlying bone deterioration, and ridge volume reduction can result from inadequate soft tissue coverage. It is frequently necessary to take a second impression of the residual ridge in order to ensure that a distal extension base is well supported [3].

Flexible Direct Retention

Direct retainers need to allow forces from the movement of the denture base to be dispersed. When forces are applied to the removable partial denture, each direct retainer should be made to flex or shift into a region of greater undercut. An essential component of a good removable partial denture service is clasp design [4].

Indirect Retention

Denture bases may occasionally be lifted away from the supporting tissues by sticky foods. The detachable partial denture rotates around the most posterior abutment as a result of this displacement. To protect the remaining teeth and oral tissues, rotation must be managed. Auxiliary rests, known as indirect retainers, should be positioned as far away from the fulcrum line as is practicable in order to achieve this goal [4].

Factors Influencing Support of the Distal Extension Base

The factors that Influencing the support of the distal extension Base is, quality of soft tissue covering edentulous ridge, type of bone in the denture-bearing area. 3- Design of the prosthesis, amount of tissue coverage of denture base, anatomy of the denture-bearing area, type and accuracy of the Impression Registration, fit of denture base and total occlusal load applied [5].

Impression Materials

Dental impression: an imprint of the teeth and surrounding structures used in dentistry to replicate the shape of the teeth and surrounding tissues; a negative likeness or copy in reverse of an object's surface. The Prosperities of ideal impression, accurate surface detail reproduction, ease of mixing and handling, appropriate working and setting time, compatibility with die and stone, non-toxicity or allergy to the patient, dimensional stability upon setting, acceptable taste and odor, sufficient strength, affordability, and the ability to be disinfected without sacrificing accuracy. Objectives of an ideal impression are retention, stability, support, preservation of remaining structure [6].

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.

Rigid Impression Materials

Elastic impression material has totally replaced the hard impression material known as impression plaster. It is highly accurate and hydrophilic and mucostatic. The material's drawbacks include its inability to record undercuts due to its rigidity once set and the patient's complaint of a very dry sensation following impression taking due to the material's water-absorbing properties. Impression Compound is described as a rigid, reversible impression material that solidifies through physical transformations, it softens when heated and hardens when cooled, drawbacks of this material, it compresses the mucosa, and the surface detail is poor. Zinc Oxide Eugenol, this material possesses mucostatic properties that accurately record surface characteristics because of its good flow, drawbacks of this material because the paste has a tendency to stick to the skin, Vaseline should be applied to the skin surrounding the lips to facilitate cleaning, eugenol may give you a burning feeling [7].

Elastic Impression Materials

Alginate and other irreversible hydrocolloids Since alginate impression materials are inexpensive and have high wetting qualities, they are frequently utilized to create diagnostic casts for full-arch impressions. Additionally, they can be utilized to create immediate/interim complete or partial denture prostheses, drawbacks of alginate, tears easily, dimensionally unstable as a result of imbibition and syneresis. Reversible Hydrocolloid, the name comes from the fact that the manufacturer supplies it as a preformed gel that is liquefied before use, at high temperatures, the agar undergoes a reversible reaction, transforming from a sol to a gel form after colliding, drawbacks of agar, special equipment is needed, such as water-cooled trays and agar conditioning machines, dimensionally unstable and have low tear strength. Polyether Because of their hydrophilic properties, these materials can be utilized in wet environments. They also make it simpler to make gypsum casts because of their high wetting qualities. These substances can be used alone or in conjunction with a syringe and tray, and they come in low, medium, and high viscosity varieties. Polysulfide impression Additionally, removable partial denture impressions and, more specifically, secondary corrected or revised cast impressions can be made using the Mercaptan rubber-base (Thiokol) impression materials, polysulfides come in two tubes: one for the

base and one for the catalyst. There are three different viscosities of polysulfides, low, medium, and high, drawbacks to polysulfide are staining, bad smell and have a longer setting time than materials made of irreversible hydrocolloid. Compared to other elastic imprint materials, silicone impression materials are easier to use and more accurate. Different kinds of silicone impression materials exist, including: a. condensational silicone, have a moderate working time of five to seven minutes, which may be changed by varying the accelerator's amount, they have good recovery from deformation, a pleasant smell, and a somewhat high tear strength. Because silicone impression materials are hydrophobic, cast formation may be a concern. 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 [8,9].

Impression Techniques

Anatomical impression technique

The edentulous ridges do not support the R.P.D because the surface contour of the ridge is measured at rest (no occlusal load). The teeth and soft tissues are captured in their anatomical shape in a single, pressure-free impression, alginate is the material of chois to this technique. (Kennedy's class III and class IV tooth-supported partial dentures are advised to use it. These saddles are bounded [10]. The main limitation of an anatomic (pressure-free) impression in a distal extension case is that while the removable partial denture may fit with ideal occlusal contacts at rest, when the patient clamps or chews, the denture base depresses along with the underlying mucosa. This leads to diminished masticatory efficiency and places a torque on the abutment teeth. Under functional load, the denture base behaves like a harmful lever, pivoting about the abutments and focusing occlusal forces onto a small region at the most distal edge of the edentulous ridge where the base ends. This focal stress accelerates residual ridge resorption in that region [11].

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 [12].

Indications for Functional Impression

Because the residual ridge mucosa does not displace uniformly, a functional impression becomes necessary in distal-extension removable partial dentures, particularly when the edentulous span is short. In some patients, there is little difference between the ridge's anatomic form and its functional form under load (John *et al*., 2004). For these cases, soft tissue displacement is minimal, and the functional and anatomic contours may appear nearly identical [13]. To decide whether a functional impression is required, a clinical test can be used, acrylic resin bases are attached to the framework, the framework is inserted intraorally, and finger pressure is applied to the base. If the base displaces enough to cause the indirect retainers or lingual rests to lift from the supporting teeth, a functional impression technique is advised [13]. This technique is especially indicated in mandibular distal-extension situations, since the stress-bearing area of the ridge is limited. Another clear indication for the dual impression technique is a long-span anterior edentulous area (often including six or more anterior teeth), where the ridge must provide additional support for the prosthesis [14].

Methods for Obtaining Functional Support for the Distal Extension Base

Establishing adequate functional support for distal extension bases in removable partial dentures (RPDs) is essential to control rotational forces and prevent overloading of both abutment teeth and the residual ridge. Traditional anatomic impressions capture tissues at rest and therefore fail to reflect the compressibility of mucosa under occlusal function, often resulting in instability and harmful lever action. To address this limitation, various functional impression methods are employed. The altered cast technique remains the most widely accepted approach, as it allows the edentulous ridge to be recorded under controlled functional loading, enhancing adaptation and distributing occlusal forces more uniformly [15]. Selective pressure techniques are another option, wherein stress-bearing regions of the ridge are intentionally loaded while providing relief in less favorable areas to optimize denture support [16]. Furthermore, dynamic functional impression methods using resilient impression materials or tissue conditioners during function have been advocated to reproduce more physiologic tissue contours [17]. Collectively, these approaches improve denture base stability, reduce localized resorption, and extend the service life of distal-extension RPDs.

Differences Between Functional Impression Techniques

1. Altered Cast Technique

- Concept: Records the edentulous ridge under *controlled functional pressure* after the metal framework is tried in.
- Process: Framework is seated; custom trays (attached to framework) are loaded with low-viscosity material (e.g., ZOE paste); impression is made while maintaining functional pressure.

- Advantage: Provides excellent load distribution between teeth and ridge; considered the "gold standard" for mandibular distal-extension RPDs.
- Limitation: Time-consuming, technically demanding [18].

2-Selective Pressure Technique

- **Concept:** Records ridge with *intentional pressure only on primary stress-bearing areas* (buccal shelf in mandible, hard palate in maxilla) while relieving weak/non-stress-bearing areas.
- **Process:** Special relief is incorporated in the tray; impression material is placed to compress selected zones.
- **Advantage:** Maximizes support in strong tissues, minimizes trauma to fragile tissues.
- **Limitation:** Requires precise knowledge of anatomy; risk of uneven stress distribution if poorly executed [19].

3- Functional / Mucostatic-Mucocompressive Combination

- **Concept:** Captures the ridge *during function* using resilient materials.
- **Process:** A tissue conditioner or functional impression material is placed in the denture base, and the patient performs normal functions (chewing, swallowing, speaking) over hours or days.
- **Advantage:** Provides the most physiologic representation of tissues under actual function.
- **Limitation:** Technique sensitive; material must be carefully monitored and replaced if distorted [20].

4- Dynamic Functional Impression

- **Concept:** Captures the ridge *during function* using resilient materials.
- **Process:** A tissue conditioner or functional impression material is placed in the denture base, and the patient performs normal functions (chewing, swallowing, speaking) over hours or days.
- **Advantage:** Provides the most physiologic representation of tissues under actual function.
- **Limitation:** Technique sensitive; material must be carefully monitored and replaced if distorted [20].

CONCLUSION

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

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