



CONCEPTS IN RPD IMPRESSION TAKING.

KEYWORDS

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ABSTRACT

The critical need for finely detailed and meticulously accurate impressions in the practice of partial denture prosthodontics does not need elaboration. The impression for a removable partial denture differs from one for a complete denture in important respects. A thorough understanding of the characteristics of each of the impression materials. The expression making the impression rather than taking the impression is used to refer to the impression phase of partial denture construction to indicate that this procedure is not a passive activity in which the impression material accomplishes the task and the operator is merely an observer.

INTRODUCTION

An impression has been defined by the Glossary of Prosthodontic terms as "a negative likeness or copy in reverse of the surface of an object; an imprint of the teeth and adjacent structures for use in dentistry".

A partial denture impression is defined as "A negative likeness of a part or all of a partially edentulous arch".

The critical need for finely detailed and meticulously accurate impressions in the practice of partial denture prosthodontics does not need elaboration. Unless the cast upon which the prosthesis is to be fabricated is an exact replica of the mouth, the prosthesis cannot be expected to fit properly, and, of course, an accurate cast can only be obtained from an accurate impression. The impression for a removable partial denture differs from one for a complete denture in important respects. The complete denture impression records soft tissue only. The partial denture impression must accurately register the relatively soft, yielding tissue (the oral mucosa) at the same time that it records a hard unyielding substance (the remaining teeth). The procedure is further complicated by the fact that the hard structures are irregular in contour as well as varying in their vertical postures relative to the occlusal plane. Because of this bell-shaped contour and variance of vertical alignment of the teeth, the impression material must be capable of entering into intimate contact with each crown surface of each tooth, withstanding the momentary distortion which occurs as the impression is withdrawn, and then instantly springing back to its original form without rupture or distortion. This elastic rebound of the impression material is an essential physical property which ensures that the teeth on the master cast are precisely accurate reproductions in every detail of their counterparts in the mouth. A partial denture made to fit such an exact replica will also fit the mouth.

CONCEPTS AND RATIONALE

If the RPD being fabricated includes only a tooth-borne denture base area, then the master cast secured by the one step impression technique is a sufficient one on which to complete the denture base. Since the support for this denture is provided by the periodontal ligaments of the anterior and posterior abutments bounding the residual ridge, the base of this denture requires only a contact relationship with the residual ridge surface (Applegate, 1965). Therefore, the anatomic accuracy that can be attained by the use of an irreversible hydrocolloid technique is sufficient to produce a master cast for a tooth-borne RPD.

However, when the design of an RPD includes a unilateral or bilateral distal-extension denture base, a simple impression procedure, one that records only the anatomic form of the residual ridge, is not sufficient to produce the type of RPD service that can preserve all of the remaining oral tissues (tooth, bone, and mucosa) in health (Beresin and Schiesser, 1978; Holmes, 1965). To achieve this often

elusive goal the dentist must understand both the problems presented by the dual nature of the supporting structures of the partially edentulous ridge and the chronic degenerative processes of residual ridge reduction (Atwood, 1971, Carlsson, Hedegard, and Koivumma, 1965; Tallgren, 1972).

The ultimate supporting medium of the RPD is bone (DeVan, 1956). The intermediary attachment medium between the abutment tooth and the alveolar bone is the periodontal ligament; between the denture base and the residual ridge is the alveolar mucosa or mucoperiosteum. There is an obvious resiliency differential between these attachment media, with the periodontal ligament being essentially nonresilient and the alveolar mucosa exhibiting varying degrees of resiliency (McLean, 1936). As reported by Steiger and Boitel (1959), the resiliency of the tissue-fitting surface of the denture base ranges from 0.4 to 2.0 mm, compared with the resiliency of 0.1mm for healthy periodontal tissue. Tissue resiliency is therefore four to twenty times the axial displaceability of the abutment tooth (Steiger and Boitel, 1959). The problem of achieving successful function of an RPD then becomes one of equilibrating this resiliency differential between the relatively non-resilient periodontal ligament of the abutment tooth and the more resilient mucosa covering the residual ridge in such a way that, in function, the RPD will generate and dissipate forces equitably between these two media. If this effort is successful and all other factors remain equal, the goal of the RPD service, namely, the preservation of tooth, alveolar bone, and residual ridge, will be enhanced.

A stable RPD is one that is able to maintain its positional relation to supporting bone when functional forces are applied to it (DeVan, 1952). This obviously is a theoretical ideal. In practical terms, it is a task of monumental proportion, and it is hardly possible to harness all the forces that can be generated on an RPD and its abutments and resolve them into forces that are directed solely axially to the abutments and perpendicularly to the residual ridge. However, that theoretical ideal should be pursued if the goals of RPD service are to be attained.

In considering RPD stability, the denture base, even though properly designed and fabricated, cannot by itself ensure functional stability unless it is complemented by the design of the metal framework and the occlusal scheme of the prosthesis. The framework design should feature rigid major connectors with multiple supporting areas for stress distribution and lateral force attenuation (Steffel, 1951), and the occlusal contacting surfaces should resolve the bolus forces of mastication essentially vertically to the residual ridge and axially to the abutment teeth (Moore, 1955). Only when all three factors—framework, occlusion, and denture base work in concert, each fulfilling its responsibility to the utmost, can effective RPD stability be developed.

With this in mind, the denture base of the distal-extension RPD

should be considered an entity in itself. It should be able to sustain itself by itself, its retention and stability being assured with minimum imposition on the framework. In this regard, principles that apply to impression making for complete dentures must be considered for the distal-extension RPD base (Leupold and Kratochvil, 1965).

To evaluate the effectiveness of each as it relates to the denture base of the distal-extension RPD requires a review of some basic biologic and physical concepts.

IMPRESSION MATERIALS FOR REMOVABLE PARTIAL DENTURES
Impression materials commonly used in removable partial denture construction are flexible substances which can be placed into the mouth in a plastic state, stiffened, and then removed from the mouth without undergoing permanent deformation. The most popular materials for removable partial denture impressions today are irreversible hydrocolloids and the elastomeric impression materials. Reversible hydrocolloid and zinc oxide paste also provide versatility for practitioners confronted with special clinical problems. A removable partial denture impression must accurately record minute details of all teeth and soft tissues from buccal vestibule to buccal vestibule. The cast formed from the impression needs the same quality of crispness and accuracy as a ¾ crown die. All rests, guideplanes, and lingual and labial contours of the remaining teeth must be accurately recorded. As a further complication, researchers have demonstrated a flexure of the mandible in the open mouth position (the position in which most impressions are made), so that, open and closed mouth dimensions of these variables it is absolutely imperative that impression materials be manipulated according to the manufacturer's instructions.

The objectives of a removable partial denture impression are to:-

1. Record the anatomic form of teeth in the dental arch.
2. Record the supporting tissues in their physiologic resting form.
3. Combine the supporting soft tissue form with the hard tissue support in a functional relationship.

Most impression materials used in prosthetic dentistry may be included in the following classification:

- Rigid materials
- Plaster of Paris
- Metallic oxide pastes
- Thermoplastic materials
- Modeling plastic
- Impression waxes and natural resins
- Elastic materials
- Reversible hydrocolloids (agar-agar)
- Irreversible hydrocolloids (alginate)
- Polysulfide impression materials
- Silicone impression materials
- Polyethers

TYPES OF IMPRESSIONS

Impression-making procedures for removable partial dentures fall into following broad general groups.

- 1) Tissue placement with pressure techniques, which essentially cause tissue displacement, and nonpressure, or "mucostatic", techniques (Bohannon, 1954; Collett, 1965).
- 2) Open mouth and closed mouth technique : Techniques of obtaining the impression may be classified, according to the method used to record the tissues, into (1) the open mouth method, and (2) the closed mouth method. The open mouth technique consists in introducing the tray containing the impression material into the mouth and holding it in place until the material has gelled or set. The closed mouth method, on the other hand, entails placing the impression tray in the mouth and having the patient hold it in place by occluding on it. Usually this technique is employed with a denture that is to be refitted (a relined), or by means of a customized impression tray. If a custom tray is employed, an occlusion rim of modelling composition is attached to the tray upon which the

patient can comfortably close as the impression is being registered.

3) Single impression and dual impression technique : The first involves the use of a single mix of impression material to make an impression and a one-piece cast to fabricate the prosthesis. The impression is usually made with alginate (irreversible hydrocolloid) impression material in a stock tray, and the basal surface of the denture is formed on the cast obtained from this record of the teeth and soft tissues. Most tooth-borne removable partial dentures, are constructed in this manner.

The second group involves the use of a two-section impression and either a one or a two-section cast to fabricate the prosthesis.

These are two subdivisions within this group. The proponents of one technique advocate making an impression of the edentulous ridges with the tissues in a functional position, and the proponents of the other advocate making the impression with the mucosal tissues at rest. For example, Hindels uses a technique for making a two-section impression of the tissue in a functional position, while Applegate uses a technique for producing a two-section cast from what he describes as an anatomic, or tissue-at-rest, impression. Others believe that impressions produced by both techniques register a functional relationship between the edentulous and the dentulous regions in the dental arch and use an altered-cast procedure to obtain a registration with the mucosal tissues at rest.

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.

Most authors on the subject of partial dentures have recognized this fact and have given it major consideration. McLean stated : "The basic problem of partial denture stabilization is to equalize the resilient and non-resilient support". While there seem to be very few arguments concerning the truth of this statement, a multitude of methods have been suggested as a solution to this problem.

CONCLUSION

A thorough understanding of the characteristics of each of the impression materials leads to the obvious conclusion that no single material can record both the anatomic form of the teeth and tissues in the dental arch and, at the same time, the functional form of the residual ridge. Therefore, some secondary impression method must be used.

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