Theories of Impression Making and their Rationale in Complete Denture Prosthodontics

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ABSTRACT

Theory means observation based on principles and concept is the application of these theories. Impression forms an important virtue for the success of complete denture treatment and hence the concepts of impression should be properly understood. The importance of the in-depth study of history of impression making for complete dentures lies in the thorough understanding of different types of techniques and theories proposed from time to time.

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INTRODUCTION

Since, the time immemorial, there have been different theories that had been advocated. Green Brothers were the first to introduce the principle of mucocompression during impression technique. The shortcomings of this principle gave rise to the mucostatic technique by Harry L Page with high regard for tissue health. But again due to the disadvantage of this technique, there was an impetus for the introduction of the selective pressure technique which combined the concepts of both the previous techniques. There are various techniques adopted by different practitioners and there may be as many techniques as the number of dentists regarding impression which in general means negative likeness but in prosthodontics it is the negative registration of the denture bearing, denture stabilizing, denture bracing and peripheral limiting structures obtained in one of the plastic/semiplastic materials which is registered at the moment of crystallization of the impression material.

At the moment of crystallization means that the tissues are registered at a particular moment. Since, the denture bearing tissues are always in a state of flux with new cells being generated and cells being shed off at different moment of time, the tissues at the time of impression making will differ from that at the time of denture insertion.

REVIEW OF LITERATURE

It is not feasible to group all the techniques into rigid compartments but a broad classification is possible. They may be classified as scientific/empiric depending on whether they are based on knowledge of anatomy.

a. They may be classified as open/closed mouth impressions depending on the condition of the mouth at the time of impression making.
b. They may be classified as either pressure, nonpressure/ minimal pressure, and selective pressure depending on the amount of pressure applied at the time of making impressions.

Prior to 1600 complete denture replacement were not made due to lack of understanding of retention. In 1711, Mathian Gottfried Purman recorded the use of wax.

In 1728, Pierre Fauchard made dentures measuring the mouth with compasses and cutting bone into an approximate shape for the space to be filled.

In 1736, Phillip Pfaff of Germany made impressions in wax sections of half of the mouth at a time.

1845 to 1899

In 1886 Richardson mentioned about making plaster impressions of tissues at rest and achieving adhesion by contact. Concepts of atmospheric pressure, maximum extension of the denture bearing area, equal distribution of pressure and close adaptation of the denture bearing tissues were stressed.

Many changes in impression making became evident during this era. A single impression formerly deemed sufficient, advanced to a method using preliminary impression of gutta-percha, beeswax or modeling compound followed by secondary wash impression made of plastic within preliminary impression.

1900 to 1929

A concentrated effort was directed toward accuracy. Most impressions were of compressive type and by the closed mouth technique. To prevent build-up of excessive pressure, vents were made.

CLOSED MOUTH TECHNIQUE

In this technique the supporting tissues recorded in a functional relationship. The movements of all related tissues were within normal functional movements such as swallowing, talking, sucking and occlusal contacts. A pressure similar to that of mastication was developed.
through the occlusion rims. This according to Stanley P Freeman—amount of tissue compression is like that in function.

**SELECTIVE PRESSURE TECHNIQUE**

The disadvantage of closed mouth technique is the tendency of overextension or underextension. Release of pressure of occlusion may cause a rebound of denture. It is contraindicated in the presence of considerable amount of movable tissue.3

The open mouth technique is preferred because the operator can see whether the border molding is done properly. The functional manipulation cannot be used routinely, not all patients can truly move the impression materials as needed.

**POSTERIOR PALATAL SEAL**

The concept of posterior palatal seal was developed for the first time by Lieberthal and Greene. References were developed for movement of tissues and the mandible during impression making. Border molding was done against the direction of muscle fibers as advocated by Wilson and Fish, Swenson et al advocated manipulation in border molding in the direction of its fibers. During this era, that the concept of esthetics in impression making was introduced.

**MUCOCOMPRESSIVE TECHNIQUE**

The mucocompressive technique was initiated by Greene Brothers.4 They introduced a modeling plastic, a method for manipulating it and a technique that is said to have been the first to utilize the entire denture bearing area for denture retention. They were the first to teach the closed mouth all modeling plastic technique. The main objective of this technique was to attain better retention of the dentures.

The technique by Greene brothers was as follows:

A preliminary impression was made in impression compound and a custom tray was constructed using base-plate with its periphery 1/8th inch shorter than the denture outline. With this tray another impression with compound was taken. Well fitting rims with uniform occlusal surface were made and the height of the bite adjusted against a similar bite rim on the mandibular ridge. Areas to be relieved like median raphe were softened on the impression and were again inserted in the mouth and were held under biting pressure for 1/2 minutes. The peripheral margins of the impression were then softened and border molding was done by asking the patient to give various cheek and lip movements as in whistling and smiling.

The posterior palatal seal was obtained by swallowing movements by the patient under biting pressure. The claim made by the advocates of this technique was that since border molding was done in their functional positions, the final dentures would retain well and cannot be dislodged during functional movements of the jaw.

The amount of pressure applied to the tissues in the mucocompressive technique was not only great but was applied to the center of the palate and the peripheral tissues which were not well suited to receive the maximum biting load and this interferes with normal blood supply of the tissues resulting in their breakdown.

As soon as this change took place both the peripheral seal and excellent retention were lost. Hence, the retention achieved by these means was transient and harmful to the health of tissues. Dentures made by this technique would fit well during mastication, i.e. only a short period each day, but would not be closely adapted to the tissue when the patient was at rest. This is because of the rebounding of tissues.5,6 These disadvantages indicated a need for spacer in the custom tray fabrication.

**MUCOSTATICS**

Concept of mucostatics11 was introduced by Harry L Page in 1938.

Addison in 1944 also mentioned the same principle of making impressions of displaceable tissue in its passive state and considered interfacial surface tension as one of the main factors of retention. With new materials like zinc oxide eugenol, waxes, elastomers, individual tray construction was emphasized. Minimal pressure technique is based on mucostatic principle.

As published by Harry L Page in 1946 he stated that all soft tissues were chiefly fluid and 80% or more of the tissues are composed of water. According to Pascal’s law, which states that any pressure applied to a confined fluid is transmitted undiminished and equally in all directions. Page contended that since the soft tissues are confined under a denture, any pressure applied will be transmitted in all directions. The advocates of this principle considered interfacial surface tension as the only important retentive mechanism in complete dentures.11,12 Therefore, they did not resist vertical displacement, which was the only movement capable of interrupting surface tension. However, Dykins recommended a short lingual flange to resist lateral displacement.

According to the principle of mucostatics the impression material had to record without distortion, every detail of the mucosa so that a completed denture would fit all minute elevations and depressions. So much emphasis was placed
on recording details that separating substances could not be used at any point in the procedure. Mucostatics further demanded a metal base. Gold, one of the most accurate metals was by passed in favor of chrome alloy which are not considered to be quite so accurate as gold.

Page’s claim that retention is a function of surface tension alone is also objectionable because this tensile force itself is dependent upon adhesion and cohesion. The elimination of use of separating media results in distortion of the cast. The use of chrome, cobalt as denture bases results in failure of accurate detail reproduction. The mucostatic principle ignores the value of dissipating masticatory forces over as largest possible basal seat area. Further the mucostatic denture minimized the retentive role of the musculature as described by Fish in 1948.

The merit of this technique was its high regard for health and preservation of tissue.

**SELECTIVE PRESSURE THEORY**

Advocated by Boucher\(^7,8,13\) in 1950 it combines the principles of both pressure and minimal pressure techniques.

The philosophy of the selective pressure technique is that certain areas of the maxilla and mandible are by nature better adapted for withstanding extraloads from the forces of mastication. These tissues are recorded under slight placement of pressure while other tissues are recorded at rest or relieved with minimal pressure in a position that will offer maximum coverage with the least possible interference with the health of surrounding tissues.

Here, an equilibrium between the resilient and the nonresilient tissues is created.

Primary stress bearing areas of maxilla are crest of alveolar ridge and the horizontal plate of palatine bone and in the mandible it is the buccal shelf area.

Secondary stress bearing areas of the maxillary foundation are rugae area and the slopes of the ridge in the mandibular foundation.

Areas requiring minimum pressure are incisive papilla, midpalatine suture, tori in the maxilla and crest of mandibular residual ridge.

In the maxilla, the tissue underlying the region of posterior palatal seal has glandular and soft tissue between the mucous membrane lining and the periosteum covering the bone. This tissue can be more readily displaced for the maintenance of peripheral seal of the maxillary denture.

THE MUCOSEAL TECHNIQUE

It was stated by Pryor in 1948 which was introduced as a variation to the mucostatic technique.\(^15\)

The anterior lingual border is molded by the floor of the mouth with the tongue in repose. The tray is extended horizontally backward, over the sublingual glands toward the tongue to affect a border seal. Thus, this technique utilizes the benefit of minimal pressure and also provides maximum extension of denture borders and maximum coverage of denture bearing area.

Subatmospheric pressure technique based on the concept of mucostatics.

Milo V Kubalik and Bert C Buffington\(^10\) developed this technique the objective of which was to reduce the stress on any given tissue by increasing load bearing area. The form of the tissue is recorded vertically and laterally, when a controlled partial vacuum is established in impression tray specially built for the patient. It is maintained in the mouth without direct mechanical support of any kind. The difference between the subatmospheric pressure within the tray and the atmospheric pressure outside the tray is all that is needed to center the tray over the ridges in a static position. A vacuum is developed between the soft tissues and the tray. A recording material in a fluid state flows from the border region into the evacuated space and develops the basal tissues. Border seal is determined by the readings remaining constant.

**MATERIALS USED**

Alginate, modeling plastic or a reversible hydrocolloid for preliminary impression, clear acrylic resin for making the final impression, an adequate sealing agent for use around special fittings in the tray, thermoplastic border recording impression material, low viscosity impression material that seats firmly enough to avoid distortion, and periphery wax to be used as a flexible material between impression and the boxing wax.

**MOLDING EXERCISES**

For Maxillary Impression the Patient is Told

To suck on the tube (this pulls the cheeks in a starts border molding), to say ‘00000’ and EEEE alternately (This refines the border molding of the buccal and labial flanges and provides space for the frenum).

To blow against closed nostril (This flexes the soft palate and molds the posterior palatal seal area. Wipes of any excess adapted extending beyond the border of the tray).

He is told to move the mandible from side to side (This molds the flanges lateral to the tuberosities). He is also asked to open and close the mouth (This records the shape and action of the paramusculature used in extreme opening and closing movements).
For Mandibular Impression

For mandibular impression patient is asked to suck on the tube (This flexes the labial, buccal and lingual vestibular structures and mold the flanges in these regions). To force the tip of the tongue against the palate (This forcibly molds the flange in the sublingual space with the paralingual musculature). To say ‘0000’ and ‘EEEE’ alternatively (This further molds the buccal and labial flanges). To lick the upper and lower lip (This molds the flanges in the lingual space in the region of Wharton’s ducts and genioglossus muscle). To place the tongue in the right cheek and left cheek (This further molds the flange in the sublingual fold space). To swallow warm water (This molds the posterior lingual flange in relation to the palatoglossus and mylohyoid musculature). To tense and flex the lower jaw as if clenching one’s teeth (This molds the buccal flange from the external oblique ridge to the retromolar pad).

CONCLUSION

We encounter different types of ridges on daily basis and each ridge poses a prosthodontic challenge for the achievement of stable and retentive dental prosthesis. When considering conventional prosthodontics, there are a variety of impression techniques available to address the problems caused by the unsupported tissue during denture construction.

Though, there are many techniques and procedures available for a dentist to make an ideal impression, the procedures followed should be based on sound biological principles depending on patient’s oral and systemic conditions, by understanding concept of function of oral tissues, etc. Impression technique and materials should be selected on the basis of biologic factors dictated by anatomy and the physiology of edentulous mouth, accuracy of material, its handling characteristics, etc.

REFERENCES


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