ELASTOMERIC IMPRESSION TECHNIQUE FOR COMPLETE DENTURE IMPRESSIONS

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Abstract

Recent advances in impression materials and stock edentulous impression trays have resulted in simplified approaches to impression making in removable Prosthodontics. Once considered an absolute necessity, it is now possible to avoid the need for custom impression trays.

In an effort to achieve reliable master casts in a single appointment, new and innovative procedures are now available. During the fabrication of a complete denture, a double step procedure of making primary and secondary impressions in two appointments in order to achieve a master cast can be a tedious and time consuming procedure.

An alternate technique is presented in this article that may be less tedious than the traditional procedures and which reduces the chair side time for the clinician by following all the basic principles of impression making put forth in the history of impression techniques for complete denture fabrication.

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Introduction

The fabrication of conventional complete dentures is an indirect dental prosthetic process. Early in the treatment sequence, an analogue of oral conditions must be developed to proceed with denture construction.

The degree to which this analogue accurately represents a detailed simulation of oral conditions, both anatomically and mechanically, determines in large part the quality of the therapeutic outcome. One important aspect of this oral simulation involves making impressions of the denture-bearing and peripheral structures and fabricating the dental casts. Techniques used to make dental impressions of edentulous patients have been known to the profession for many decades. Although improvements in available materials have subtly influenced the process, dentistry's approach to impression making has remained remarkably consistent over the years.

Conventional wisdom, as taught in most dental institutes, includes:[1] primary reversible impression compound or irreversible hydrocolloid impressions;[2] construction of custom impression trays;[3] intraoral modification of custom impression tray border dimensions; and[4] definitive impressions made using a suitable impression material.[1-4]

Since their introduction to the profession, zinc oxide-eugenol paste[5-7] and polysulfide[8-9] impression materials have been standards for definitive edentulous impressions. Because of their material proprieties and handling characteristics, these materials require the use of custom impression trays. Custom impression trays may be formed using chemical-activated resins or light-activated resins. Clinical modification of tray borders is typically accomplished using modeling plastic impression compound, a technique that dates to the early 1900s.[10-13]

More recently, the use of polyether[14-18], vinyl polysiloxane (VPS)[16,19-25] impression

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material, or condensation-silicone (c-silicone) for custom-tray border correction has been described. Without question, these standard edentulous impression procedures have served the dental profession well and will continue to serve the profession for many years. However, it is important that the profession continuously strives to develop new procedures aimed at improved accuracy, convenience, and patient acceptance. The area of impressions in complete-denture Prosthodontics is no exception.

This article describes a method of obtaining a final impression in a single appointment using a stock metal tray by using a putty and wash vinyl polysiloxane or c-silicone impression material. Except the changes in the materials and the time required for completing the procedure, no changes have been introduced into this technique of complete denture impression making. Tips are given in this impression procedure to suit the needs, habits and requirements of wide variety of operators, techniques and philosophies.

THE BASICS

As thoroughly discussed in a number of textbooks on the subject, dentists should appreciate basic principles and objectives of impression making if successful edentulous impressions are to be achieved. The basic objectives of edentulous impressions are to facilitate denture retention, denture stability, denture support, optimal esthetics, and the maintenance of health of the oral tissue[26].

To consistently accomplish these objectives, dentists should be knowledgeable about the anatomy and function of the relevant oral structures, the materials involved in impression making, basic impression techniques, and the clinical management of patients. Impressions of edentulous arches must accommodate the anatomy and function of the oral tissue. The following basic principles should be considered[26]:

- Impressions should extend to include the entire denture foundation within the health and function of the supporting and limiting tissue.
- Impression borders should be in harmony with anatomic and functional limits of the denture foundation and adjacent tissue; therefore, impression borders should be identified using functional movements.
- Adequate space for impression material within the impression tray should be available.
- A guiding mechanism should be available to accommodate correct positioning of the impression tray relative to the edentulous ridge and associated tissue.
- The impression tray and impression material should be made of dimensionally accurate and stable materials.
- Impression contours and dimensions should correspond to the intended contours and dimensions of the planned complete dentures.

Physical properties of the impression tray and its manipulation constitute important considerations in the impression process.

Historically, the use of custom impression trays to make definitive edentulous impressions has been considered essential for accurate results. Today, stock edentulous impression trays are available that conform to the dimensions and anatomical contours suitable for edentulous patients. If stock edentulous trays are selected to make definitive edentulous impressions, several important aspects of the trays and the associated impression techniques should be considered:

- Trays should be sufficiently rigid to withstand the physical manipulations of the impression process and support dimensionally accurate definitive impressions.
- Trays should be sized appropriately for the variety of edentulous arches that may be encountered.
- Trays should permit both additive and subtractive border and flange modifications. Although metal stock trays are easy to additively adjust, the grinding of overextensions or bending of tray flanges may be problematic.
- Tray handles should be fashioned to extend from the tray and exit the mouth without disturbing the relaxed posture of the lips.
- The tray or impression system should provide a means of adequate retention of impression material within the tray.

Historically, much attention has been given to the wide variety of materials available for making edentulous impressions including plaster, modeling plastic impression compound, zinc oxide-eugenol paste, irreversible hydrocolloid, polysulfide, polyether, and VPS. Consideration of material handling properties, working time, setting time, viscosity and flow, 3-dimensional

accuracy, surface detail accuracy, hardness, elasticity, tear strength, biocompatibility, mixing requirements, cost, repeat pourability, time to pour, dental– stone interactions, disinfection properties and consequences, dimensional stability, shelf life, color, odor, taste, availability, and clean-up characteristics may contribute to material selection. Most currently available impression materials perform satisfactorily for edentulous impressions when applied under appropriate clinical conditions and in the hands of skilled operators[27].

Ultimately, the choice of impression material may depend more on the dentist's familiarity with a material rather than specific handling characteristics or material properties. The concept of the "correctable impression" is a convenience worth consideration (e.g., modeling plastic impression compound is thermoplastic and repeatedly molded to refinement, while VPS can be cut back and laminated to improve contours). With the recent popularity of VPS and polyether for fixed Prosthodontic impressions and the convenient availability of these materials in most dental offices, their use for edentulous impression making may be based on convenience and dual use in the dental environment.

ELASTOMERIC IMPRESSIONS

VPS, an addition reaction silicone impression material or C-Silicone impression material, offers a number of distinct advantages for making definitive impressions during complete denture therapy, including:

- Manufacturers provide a series of materials from which to choose that possess different viscosities and working times. Material viscosity can be varied throughout the impression surface based on tissue consistency and impression philosophy.
- The material delivery system typically involves automix cartridges, manual dispensing guns or automatic mixing machines, and spiral mixing tips. The mixing tips that introduce the material into the impression tray are sized for this task.
- Sequential additions of new impression material to existing, cured material in the tray will effectively adhere when polymerized. This permits a layering or build-up approach to impression making.
- Although working and polymerization times vary for different products on the market, VPS materials permit ample working time for the applications described in the present article.
- The material is sufficiently elastic. When soft- and hard-tissue undercuts are encountered during impression making, the impression can be retrieved from the mouth and clinically acceptable elastic recovery achieved.
- The material has clinically acceptable tear strength. When making impressions for immediate complete dentures, the material will tear and release from interproximal tooth areas when the impression is removed from the mouth. This is particularly true when low viscosity materials are selected.
- Newer products in this class of impression materials have been chemically manipulated by manufacturers to improve their wettability or hydrophilicity. The addition of nonionic surfactants produces hydrophilized addition silicone. These more hydrophilic materials wet soft and hard tissue better, facilitate the gypsum products, and result in improved dental-cast surface properties[28-31].
- The material does not generally induce sensitivity reactions in patients or operators.
- The material does not possess an offensive taste or odor.

CLINICAL CONDITIONS AND IMPRESSION PHILOSOPHIES

Careful examination of the residual tissue that comprise the edentulous ridges and denture-bearing areas reveals a wide range of soft- and hard-tissue conditions, contours, consistencies, and attachments.

The capacity of the residual tissue to provide support, stability, and retention to the planned complete dentures varies across the denture-bearing area in each patient and can substantially differ among patients in general.

Management of the tissue before and during definitive impression making will dramatically influence the fit, function, and comfort of the final prostheses.

With regard to impression making and the delivery of force to the denture-bearing tissue, 3 dominant theories have been put forward:

(1) definitive-pressure impressions;
(2) minimal-pressure impressions; and
(3) selective-pressure impressions.[32]

TECHNIQUE

- Select a stock metal edentulous tray that is in accordance with the size and shape of the patient's edentulous ridge. Proper tray selection in this technique is of utmost importance for the success of this impression technique.

- After selection of the tray, any modification that is required for proper adaptation of the tray is done by bending or trimming the borders of the tray.

- Once the tray is selected and adjusted according to the patient's requirement, a suitable tray adhesive is applied onto the impression surface of the tray. Care is taken to apply the manufacturer recommended tray adhesive.

- After applying the tray adhesive suitable amount of putty impression material (Zetaplus, Italy) is taken and mixed according to the manufacturer's instructions. After loading the tray the initial impression procedure is completed. It is strictly recommended to ask the patient to perform various functional movements whilst recording the impression, in addition to the muscle trimming being done by the operator.

- After making the initial putty impression the ideal tray borders are marked with an indelible pencil. (Fig .01)

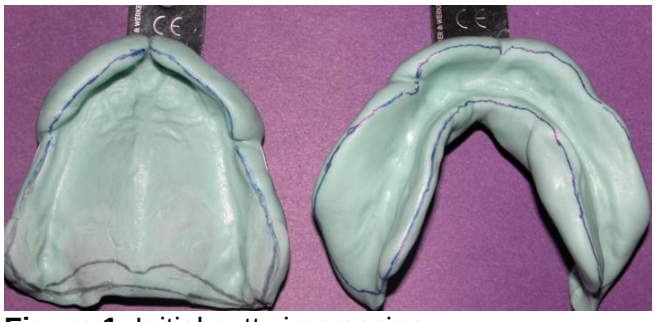

Figure 1. Initial putty impression.

- The impression borders are then cut 2 to 3mm both in length and width in order to provide space for the additional putty impression, which will be subsequently added to complete the process of border molding. (Fig .02)

Border molding is a process defined as, "the shaping of the border areas of an impression material by functional or manual manipulation of the soft tissue adjacent to the borders to duplicate the contour and size of the vestibule."[33] elastomeric impression materials provide a distinct advantage as border-molding materials.

Figure 2. Initial putty impression, with borders cut by 2mm, to facilitate putty border molding.

The dentist can select from a number of viscosities based on the clinical conditions at hand. For example, in the typical edentulous maxilla characterized as having average ridge dimensions, high-viscosity VPS works well as a border molding material. However, when impressing a severely resorbed edentulous mandible, the authors prefer to use medium-viscosity VPS to increase material flow against the less substantial tissue.

To accomplish border molding of the maxillary tray, dispense a rope of putty-viscosity (Zetaplus, Italy) along the peripheral tray borders including the postpalatal seal area. Place and center the tray on the maxillary arch. Use the following tissue manipulations to define peripheral borders:

- To define the labial notch, grasp the philtrum close to the vermilion border and pull downward.
- To form the labial vestibular borders, ask the patient to purse the lips using a sucking action and then to smile widely.
- To define the buccal notches and buccal vestibular borders, grasp the cheek with the forefinger and thumb at the corner of the mouth and pull downward and forward. Repeat this process on the opposite side.
- To define the coronomaxillary vestibular border and hamular notch area, ask the patient to open the mouth wide. This will cause the coronoid processes to translate through the coronomaxillary spaces, bringing the associated muscles to their terminal positions. If the mandibular opening is restricted, instruct

the patient to move the mandible from side to side.

- To functionally form the posterior border of the tray, instruct the patient in Valsalva's maneuver[34-36]. Manually occlude the patient's nostrils and ask the patient to forcibly exhale through the nose only. This causes the soft palate to valve downward, and records the posterior palatal seal.
- After the impression material polymerizes, remove the maxillary impression tray and inspect all peripheral borders to assure appropriate anatomic and functional detail is represented. (Fig.03)

Figure 3. Trays after completion of border molding.

To accomplish border molding of the mandibular tray, dispense a rope of putty viscosity (Zetaplus, Italy) along the peripheral tray borders. Center the tray on the mandibular edentulous ridge. Use the following tissue manipulations to define peripheral borders:

- To functionally form the lingual and retromylohyoid flange borders, have the patient place the tip of the tongue forward out of the mouth and have the patient move the tongue side to side. Next, have the patient retract the tip of the tongue to touch the posterior palate.
- To form the labial notch, grasp the lower lip at the vermilion and pull outward and upward.
- To functionally form the labial and buccal borders, stabilize the tray with the index and middle fingers on the finger rest and the thumb under the chin. Ask the patient to purse the lips using a sucking action and then to smile widely.
- To form the buccal notches, grasp the cheek with the forefinger and thumb at the corner of the mouth and pull upward and forward. Repeat this process on the opposite side.

After the material polymerizes remove the mandibular impression tray and inspect all peripheral borders to assure that appropriate anatomic and functional detail is represented[37]. (Fig.03)

- Areas which are to be relieved are marked (incisive papilla, mid-palatine raphae, in maxillary arch and crest of the ridge in the mandibular arch), with indelible pencil. A round bur of 1mm diameter is then taken and the areas that are to be relieved are reduced, in accordance with the Boucher's selective pressure impression technique.

- In case the operator feels the need for stoppers, the stopper areas are marked with the indelible pencil and all the other areas are reduced with a putty-cutting instrument. This will give raised areas in the areas marked before, which will then act like stoppers. (Fig .04)

Figure 4. Impressions with space created for definitive impression and showing the elevated tissue stops.

- Final impression is then made with low viscosity C-Silicone impression material (Oranwash L, Italy) to complete the impression technique. (Fig .05)

Figure 5. Completed definitive impression.

Summary

Making acceptable final impressions when fabricating complete dentures is an important requirement for the successful treatment of edentulous patient.

The technique presented in this article represents an alternate impression technique for the clinician who thoroughly understands the basic principles in complete denture prosthodontics and has the clinical ability to evaluate and assess intraoral tissues of an edentulous patient.

The clinician can use different viscosities of impression material and stock metal trays to border mold and create an impression of edentulous arch efficiently and accurately, as an effective clinical solution for the contemporary practice of treatment of the edentulous patient[38].

Conclusions

This article describes the recent advances in definitive impression-making techniques for use in complete denture therapy. Improved impression materials and new stock edentulous impression trays permit the application of modern procedures aimed at single impression master cast development.

VPS impression / C-silicone material performs well in this application because of the favorable range of available viscosities and working times, delivery system, sequential layering ability, elasticity, tear strength, hydrophilicity, biocompatibility, taste, and smell.

Even though the technique minimizes the necessary chair side time, care is taken not to deviate from the basic philosophies of complete denture impression techniques. The clinical techniques described can be readily and successfully incorporated into any dental practice involved with complete-denture patients.

Declaration of Interest

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References

1. Arbree NS, Fleck S, Askinas SW. The results of a brief survey of complete denture prosthodontic techniques in predoctoral programs in North American dental schools. J Prosthodont. 1996; 5:219-225.
2. Petropoulos VC, Rashedi B. Current concepts and techniques in complete denture final impression procedures. J Prosthodont. 2003; 12:280-287.
3. Petropoulos VC, Rashedi B. Complete denture education in U.S. dental schools. J Prosthodont. 2005; 14:191-197.
4. Petrie CS, Walker MP, Williams K. A survey of U.S. Prosthodontists and dental schools on the current materials and methods for final impressions for complete denture prosthodontics. J Prosthodont. 2005; 14:253-262.
5. Ross RA. Zinc oxide impression pastes. J Am Dent Assoc. 1934; 21:2029-2032.
6. Cotter SW. Zinc oxide paste – An impression material. Illinois Dent J. 1938; 7:392-398.
7. Trapozzano VR. Securing edentulous impressions with zinc oxide-eugenol impression paste. J Am Dent Assoc. 1939; 26:1527-1531.
8. Pearson SL. New elastic impression material: a preliminary report. Br Dent J. 1955; 99:72-76.
9. Rosentiel E. Rubber base elastic impression materials (A preliminary note). Br Dent J. 1955; 98:392-394.
10. Prothero JH. Prosthetic Dentistry, Northwestern University Dental School: Chicago IL, 1904:11-22.
11. Greene JW. Greene Brothers' Clinical Course in Dental Prosthesis in Three Printed Lectures. 5th ed. Detroit, Mich: Detroit Dental Manufacturing Company; 1916:17-49, 89-115.
12. Clapp GW, Tench RW. Professional Denture Service. New York, NY: The Dentists' Supply Company; 1918:14-96.
13. Wilson GH. A Manual of Dental Prosthetics. 4th ed. Philadelphia, PA: Lea & Febiger; 1920; 63-135.
14. Smith DE, Toolson LB, Bolender CL, et al. One-step border molding of complete denture impressions using a polyether impression material. J Prosthet Dent. 1979; 41:347-351.
15. Christensen GJ. Impression materials for complete and partial prosthodontics. Dent Clin North Am. 1984; 28:223-237.
16. Felton DA, Cooper LF, Scurria MS. Predictable impression procedures for complete dentures. Dent Clin North Am. 1996; 40:39-51.
17. Tan HK, Hooper PM, Baergen CG. Variability in the shape of maxillary vestibular impressions recorded with modeling plastic and a polyether impression material. Int J Prosthodont. 1996; 9:282-289.
18. Davis DM. Developing an analogue/substitute for the maxillary denture-bearing area. In: Zarb GA, Bolender CL, Eckert SE, et al, eds. Prosthodontic Treatment for Edentulous Patients: Complete Dentures and Implant-Supported Prostheses. 12th ed. St Louis, Mo: Mosby; 2004:211-231.
19. Appelbaum EM, Mehra RV. Clinical evaluation of polyvinylsiloxane for complete denture impressions. J Prosthet Dent. 1984; 52:537-539.
20. Troendle RG, Troendle KB. The use of injectable polyvinylsiloxane as medium for border-molding denture impressions. J Prosthodont. 1992; 1:121-123.
21. Kois JC, Fan PP. Complete denture impressioning technique. Compend Contin Educ Dent. 1997; 18:699-710.
22. Chaffee NR, Cooper LF, Felton DA. A technique for border molding edentulous impressions using vinyl polysiloxane material. J Prosthodont. 1999; 8:129-134.
23. Hayakawa I, Watanabe I. Impressions for complete dentures using new silicone impression materials. Quintessence Int. 2003; 34:177-180.
24. Drago CJ. A retrospective comparison of two definitive impression techniques and their associated post insertion adjustments in complete denture prosthodontics. J Prosthodont. 2003; 12:192-197.
25. Lynch CD, Allen PF. Management of the flabby ridge: using contemporary materials to solve an old problem. Br Dent J.2006; 200:258-261.
26. Zarb GA, Bolender CL, Carlsson GE, et al. Boucher's Prosthodontic Treatment for Edentulous Patients. 8th ed. St Louis, Mo: The CV Mosby Company; 1980:144-169.
27. Woelfel JB. Contour variations in impressions of one edentulous patient. J Prosthet Dent. 1962; 12:229-254.

28. Norling BK, Reisbick MH. The effect of nonionic surfactants on bubble entrapment in elastomeric impression material. J Prosthet Dent. 1979; 42:324-347.
29. Pratten DH, Craig RG. Wettability of hydrophilic addition silicone impression material. J Prosthet Dent. 1989; 61:197 202.
30. Johnson GH. Impression materials. In: Craig RG, Powers JM, eds. Restorative Dental Materials. 11th ed. St Louis, Mosby; 2002:330-389.
31. Shen C. Impression materials. In: Anusavice KJ, ed. Phillips' Science of Dental Materials, 11th ed. St Louis, Mo: Saunders; 2003:205-254.
32. Sharry JJ. Complete Denture Prosthodontics. 3rd Ed. New York, NY: McGraw-Hill Book Company; 1974:191-210, 295-309.
33. Academy of Prosthodontics. Glossary of prosthodontic terms. J Prosthet Dent. 2005; 94:10-92.
34. Laney WR, Gonzalez JB. The maxillary denture: its palatal relief and posterior palatal seal. J Am Dent Assoc. 1967; 75:1182-1187.
35. Naylor WP, Rempala JD. The posterior palatal seal—its forms and functions (I)-Diagnosis. Quintessence Dent Technol. 1986; 10:417-422.
36. LaVelle WL, Zach GA. The posterior limit of extension for a complete maxillary denture. J Acad Gen Dent. 1973; 21:31.
37. Massad JJ, Cagna DR. Vinyl polysiloxane impression material in removable prosthodontics. Part 1: Edentulous impressions.2007; 28(8):452-460.
38. Massad JJ, Lobel, Garcia, Monarres, Hammesfahr. Building Edentulous impressions. A layering technique using multiple viscosities of impression materials. Compend Contin Educ Dent August 2006; 27: 446-451.