

# Vinyl Polysiloxane Impression Material in Removable Prosthodontics *Part 3: Implant and External Impressions*

## Abstract

### Joseph J. Massad, DDS

Director of Removable Prosthodontics  
The Scottsdale Center for Dentistry  
Scottsdale, Arizona

Associate Faculty  
Department of Restorative Dentistry  
Tufts University School of Dental Medicine  
Boston, Massachusetts

Adjunct Associate Faculty  
Department of Prosthodontics  
University of Texas Health Science Center  
Dental School  
San Antonio, Texas

### David R. Cagna, DMD, MS

Professor and Director  
Department of Restorative Dentistry  
Advanced Prosthodontic Program  
University of Tennessee Health Science  
Center College of Dentistry  
Memphis, Tennessee

Today, dental implant therapy is considered a valuable asset of mainstream dental therapeutics by both patients and clinicians. In many ways, the availability of implant therapy to facilitate the support, stability, and retention of dental prostheses has revolutionized the profession and the procedures dentists accomplish on a daily basis. From another perspective, the procedures used to fabricate dental implant restorations are but modifications of previously existing, proven, and reliable techniques. This is particularly true when considering impression making for implant overdentures. Part 3 of this article series looks at the use of vinyl polysiloxane impression material systems for making definitive impressions for implant overdentures. Once constructed, it is critical that all removable dental prostheses possess external contours that are geometrically compatible with the anatomic and functional requirements of the oral tissues. Therefore, this article also will address a technique for diagnostically assessing external denture contours using vinyl polysiloxane external impression procedures.

### Learning Objectives

*After reading this article, the reader should be able to:*

- discuss the benefits of implant-supported overdentures compared with conventional complete dentures.
- explain the need for accuracy when making a definitive impression of implant overdentures.
- describe how to apply the techniques presented to accomplish implant overdenture impressions.

Complete maxillary and mandibular dentures have long been considered the standard of care for treating edentulous patients. Although most patients express satisfaction with their conventional maxillary complete dentures, many struggle with the comfort and function of mandibular complete dentures.<sup>1,2</sup>

The use of endosseous dental implants to assist in the support, stability, and retention of removable prostheses is considered an effective treatment modality for edentulous patients. Individuals wearing implant-assisted overdentures typically report improved oral

comfort and function when compared with conventional, mucosa-supported prostheses.<sup>3-8</sup> Today, implant-assisted overdentures are usually the treatment of choice, except when contraindicated because of finances or surgical concerns. Recently, a symposium at McGill University addressed the efficacy of implant-assisted overdentures in the treatment of edentulism. After a thorough, evidence-based review of existing information, the following consensus statement was formulated: "The evidence currently available suggests that the restoration of the edentulous mandible with conventional dentures is



**Figure 1**—Overdenture attachment transfer impression copings in place before impression procedures (Locator Implant Attachment for Ankylos Implant System, Dentsply Friadent Cera/Med, Tulsa Dental Specialties, Tulsa, OK).



**Figure 2**—The impression tray selected is constructed from a clear polystyrene-based polymer. The clear plastic permits see-through visibility to assist when selecting and fitting the tray.

no longer the most appropriate first choice prosthodontic treatment. There is now overwhelming evidence that 2-implant overdentures should become the first choice of treatment for the edentulous mandible.<sup>99</sup>

### Vinyl Polysiloxane Implant Overdenture Impression Technique

Clinical and laboratory processes must be optimized to accurately construct implant-supported restorations. The need to make impressions of the oral structures and implant components occurs early in prosthodontic treatment. Two issues must be considered when making definitive impressions for the construction of implant overdentures: (1) the accurate registration of denture-bearing tissue and peripheral anatomy, and (2) the 3-dimensionally (3-D) accurate and stable recording of dental implant positions and individual implant trajectories. Dental stone is then cast into the impression to generate a master cast. The definitive prosthesis is constructed on this master cast. In the absence of accurate and precise impression procedures and cast-forming processes, the predictable construction of accurate restorations is nearly impossible. However, existing research in this area is limited by inadequate measurement technology, conceptually limited protocols, and mixed results.

Vinyl polysiloxane (VPS) impression materials are well suited to address both the accurate registration of denture-bearing tissue and peripheral anatomy and the 3-D accurate and stable recording of dental implant positions and individual implant trajectories. The VPS implant overdenture impression techniques involve overdenture attachment selection, tray selection and adaptation, tray stops, border molding, and the definitive impression.

### Overdenture Attachment Selection

A minimal number of implants (typically 2-4) may be used to support, stabilize, and retain overdentures. This restorative approach is both practical and clinically successful, particularly in the edentulous mandible.<sup>10,11</sup> A variety of attachment systems have been developed and marketed for use with implant-assisted overdentures. These systems often include transfer impression copings for use during the definitive impression procedures (Figure 1). Resultant master casts contain attachment analogs for directly processing attachment components within the overdenture.

Before initiating the impression procedures, the implants and the associated soft-tissue dimensions should be evaluated. The appropriate implant attachments should be selected and placed to torque specifications. Next, implant impression copings should be placed in preparation for the definitive impression.

### Tray Selection

Carefully examine the dimensions of the dental arch and select the appropriate stock impression tray (Figure 2). The impression trays illustrated here (Strong-Massad Dentate & Implant Trays<sup>a</sup>) are constructed from a clear polystyrene-based polymer and are available in 3 maxillary sizes and 3 mandibular sizes: small, medium, and large. These clear plastic trays permit see-through visibility to assist when selecting and fitting the tray. Be sure to provide sufficient room between the tray and all implant attachments and impression components. Retention slots perforate the trays to maximize the mechanical retention of the material. It is strongly recommended that VPS adhesive not be used in the trays. Rather, it is preferred that the impression material is wiped clean from the tray in areas where the tray impinges on border and peripheral tissue. This clean elimination of impression material from tray borders clearly signifies the need to accomplish subtractive adjustments of the tray before making the definitive impression.

### Tray Adaptation

Tray adaptations to existing anatomic contours are possible. These polystyrene-based polymer trays are thermoplastic. To effect subtle alteration of flange trajectory, pass the appropriate portion of the tray quickly through a micro-flame until the resin softens, being careful not to overheat the tray. Once the resin is softened, carefully manipulate the tray flange into the desired orientation. Cool the tray in water. The border extensions of the tray also may be subtractively adjusted by grinding with conventional acrylic resin rotary instrumentation.

### Tray Stops

The definitive impression procedure requires multiple placements of the impression tray in the patient's mouth. To achieve consistently repeatable tray placements, tray stops are developed. Using high-viscosity

<sup>a</sup> Global Dental Impression Trays, Inc, Tulsa, Okla; www.gdit.us.



**Figure 3**—High-viscosity VPS impression material is loaded into the tray in 3 distinct locations in order to form tray stops.



**Figure 4**—Medium-viscosity VPS impression material is applied to the tray borders to accomplish border molding procedures.



**Figure 5**—Border molding is inspected for accuracy and detail. Resin tray showthrough areas (arrows) are reduced by grinding. All borders are then reduced 1 mm to 2 mm. Finally, material around implant components (dashed line) is relieved.

VPS, dispense 3 nickel-size circles of material into the mandibular impression tray at the incisor and molar regions (Figure 3). Seat the tray on the edentulous mandible and center it over the ridge. The objective is to develop an adequate and consistent space between the tray and the denture-bearing and peripheral tissue surface and impression components. When cured, remove the tray and inspect the stops to assure an even thickness and that the ridge crest is centered within the tray. Trim the stops with a sharp knife to minimize the area of tissue contact.

Once correctly established, tray stops permit: (1) adequate and even space between the tray and denture-bearing tissue for the impression material, (2) adequate and even space between the tray and vestibular reflections for the impression material, (3) adequate and even space between the tray and implant impression components, and (4) consistently repeatable positioning on tray placement without overseating.

### Border Molding

To accomplish border molding of the mandibular tray, dispense a rope of medium-viscosity VPS along the peripheral tray borders (Figure 4). Place the tray, centering it on the mandible using the tray stops as guides. 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 move the tongue side to side. Next, have the patient retract the tip of the tongue to touch the posterior palate.

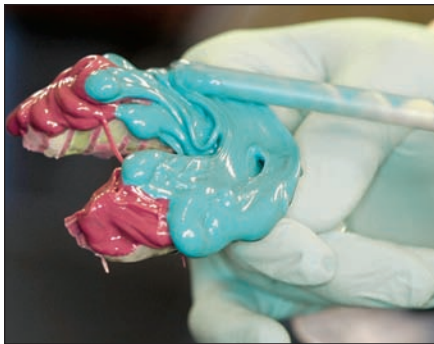
- To form the labial notch, grasp the lower lip at the vermillion and pull outward and upward.
- To functionally form the labial and buccal borders, stabilize the tray with the index and middle fingers on the finger rest and the thumb beneath the chin. Ask the patient to purse the lips using a sucking action and then 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 cure of the VPS, remove the mandibular impression tray and inspect all peripheral borders to assure the appropriate anatomic and functional detail is represented (Figure 5). If the resin tray is apparent through the border-molding material, adjust the tray by grinding. Also, relieve all borders approximately 1 mm to 2 mm using a scalpel blade or rotary instrumentation in preparation for the definitive impression. Finally, relieve any material that has engaged the implant attachment impression components.

### Definitive Impression

Before making the definitive impressions, closely examine the soft-tissue conditions across the denture-bearing tissue of the mandible. Keep in mind the location of primary denture-bearing areas. Dispense VPS impression materials into the mandibular impression tray, distributing different materials to correspond with relative tissue conditions (eg, low viscosity along ridge areas with firmly attached tissue and extra-low viscosity in areas of flabby or mobile tissue) (Figure 6). Inject low-viscosity VPS material around the implant attachment impression coping (Figure 7). Place the impression tray and center it on the maxilla using the tray stops as guides. Repeat all border molding manipulations. When the VPS is cured, remove and inspect the impression for appropriate anatomic, functional, and surface details (Figure 8).

If excessively mobile soft tissue is present at the edentulous ridge crest, special precautions must be taken before making the definitive impression with extra-low-viscosity VPS impression material. To avoid displacing the mobile soft tissue, remove the associated tray stop. Once the tray stop has been removed, care must be taken to



**Figure 6**—Medium-viscosity VPS material is applied to the retromolar pad areas, and low-viscosity VPS is applied to the rest of the tray in preparation for placement.



**Figure 7**—Low-viscosity VPS impression material is syringed around all transfer impression copings before placement of the impression tray. This procedure ensures complete engagement of the impression copings by impression material.



**Figure 8**—Definitive mandibular implant overdenture impression.



**Figure 9**—Master cast ready for continued laboratory processing.

avoid over-seating the tray during definitive impression procedures.

Once satisfied with the quality of the definitive impressions, bead, box, and cast the impression using a suitable, vacuum-mixed dental stone (Figure 9).<sup>12</sup>

### VPS as a 3-D Disclosing Material

The objective of complete denture therapy for patients with severe reduction of residual ridges is not solely the replacement of missing teeth. Rather, complete dentures must be designed to replace both the missing dentition and the associated supporting structures. In so doing, the denture base may occupy a substantial volume within the oral cavity. In addition to replacing missing oral tissue, complete dentures structurally redefine potential spaces within the oral cavity. Inappropriate denture tooth positioning and physiologically unacceptable denture base contour or volume may result in compromised phonetics,<sup>13</sup> inefficient tongue posture and function,<sup>14,15</sup> and hyperactive gagging.<sup>16-20</sup>

Carefully designed external denture contours (eg, cameo or polished denture surface contours) may contribute substantially to prosthesis stability, retention, and comfort. Successful denture wearers display patterns of oral-facial muscle activity that serve to retain and stabilize, rather than displace the prostheses. When optimally contoured, complete dentures occupy space in the oral cavity that is defined by the physiologic limits of muscle function and acquire stability and retention during mastication, swallowing, and phonation.<sup>21,22</sup> Food entrap-

ment under the denture is minimized. Conversely, poorly designed prostheses that do not accommodate the anticipated muscle function may yield compromised denture stability and reduced retention and frequently result in food accumulation under the denture.

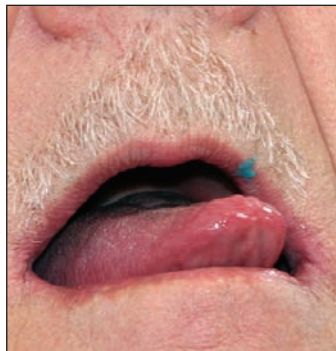
Fitting a denture's intaglio surface to the denture-bearing tissue is commonly considered a 2-dimensional process. Pressure indicator paste,<sup>23</sup> sometimes referred to as pressure disclosing paste,<sup>24</sup> is currently the most common disclosing material for identifying local denture base interferences to aid in complete and comfortable placement and wear of the prosthesis. Careful handling of pressure indicator paste will yield consistent, accurate, and reliable results. The diagnostic use of this material is indicated at the denture placement appointment and all visits after the placement, where adjustment of the denture base tissue contact is indicated.

Fitting the denture's cameo or polished surfaces to the range of normal physiologic activity of surrounding tissue within the oral cavity is a more complex, 3-D process. Although pressure indicator paste works fine for assessing the denture's intaglio fit, the evaluation of cameo surface fit requires a more substantial, 3-D disclosing medium. Materials that have been suggested for this purpose include disclosing wax,<sup>12,24,25</sup> tissue conditioning material,<sup>26,27</sup> mouth temperature impression wax,<sup>26</sup> wax and petroleum jelly mixture,<sup>28</sup> irreversible hydrocolloid,<sup>29</sup> and silicone materials.<sup>30-32</sup>

A more exacting approach to physiologically acceptable, cameo surface contouring involves the use of external



**Figure 10**—A ribbon of low-viscosity VPS impression material is dispensed along the denture border of concern.



**Figure 11**—On placement of the denture, the patient is instructed through various functional tongue movements to form the VPS disclosing material.

denture impressions during denture construction. Often associated with the neutral zone technique,<sup>33</sup> the external impression permits: (1) physiologic registration of the denture's cameo surfaces, and (2) denture tooth positioning in a physiologically neutral location (eg, buccal-lingual). External impressions are typically accomplished by applying recording material on the facial, lingual, and palatal aspects of trial dentures between the cervical limits of the denture teeth and the peripheral borders of the trial dentures. Once in place, the patient is instructed to close and purse the lips as when sucking, then swallow repeatedly. Once set, excess impression material is removed from the teeth, and the trial dentures are invested and processed using conventional procedures.

Several variations of the external impression procedure have been reported in the literature either to aid denture construction<sup>21,22,34,43</sup> or for use as a diagnostic tool during denture adjustment.<sup>26,27,32,42,44</sup>

The VPS impression materials perform well as external impression materials and 3-D disclosing materials. This is particularly true when adjusting new dentures during initial placement, or when attempting to isolate denture destabilizing flange contours at appointments after placement. To demonstrate the application of VPS impression material as a disclosing medium, the following clinical illustration is used.

A new patient presented to a dental practice having worn his new complete dentures for 3 weeks. Although the patient enjoyed reasonable function with his new prostheses, he complained of a subtle but annoying lift of the mandibular denture during speech. The patient claimed that this lift of the mandibular denture also occurred during chewing and contributed to accumulation of food debris under the denture. Intraoral examination revealed clinically acceptable occlusion and no denture-associated soft-tissue ulcerations.

On further intraoral examination, overextension of the lingual flanges into the retromylohyoid spaces was considered a possible etiologic factor. To investigate this possibility, diagnostic external impressions on the lingual flanges of the mandibular denture were accomplished. The disclosing materials selected for this procedure were low-viscosity and extra-low-viscosity VPS impression materials. A step-by-step description of the planned disclosing and adjustment procedures is given below.

### **Apply Low-Viscosity VPS**

Identify the denture area(s) of interest using the patient's reported concerns and thorough intraoral examination. In this clinical example, concerns centered on the lingual flange extension/contour of the mandibular denture. Dispense a ribbon of low-viscosity VPS along the lingual flange border (Figure 10). It is not necessary to coat the entire lingual flange because physiologic manipulations will cause the material to flow across the flange disclosing the entire area of interest. Evaluation limited to sections of the denture, rather than the entire denture border, is clinically more manageable and generally preferred.

### **Physiologic Assessment**

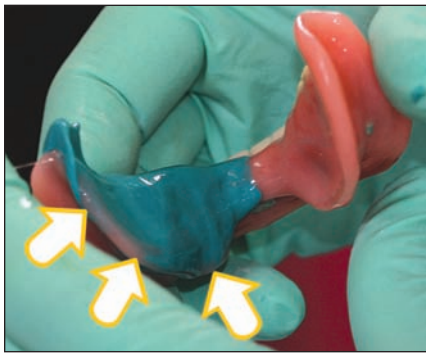
Place the mandibular denture. To functionally form the disclosing material across the lingual and retromylohyoid flange areas, instruct the patient to place the tip of the tongue forward out of the mouth and move the tongue side to side (Figure 11). Next, have the patient retract the tip of the tongue to touch the posterior palate. Repeat these tongue movements for approximately 1 minute. After 1 minute of physiologic manipulation, have the patient rest the tongue in the floor of the mouth with the dentures in occlusion until final cure of the VPS material (approximately 1 more minute).

### **Denture Adjustments**

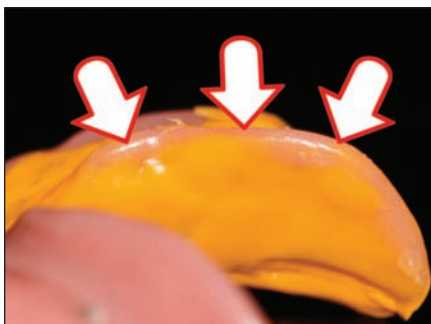
Remove the mandibular complete denture and inspect the external impression (Figure 12). The 2 conditions that should be noted include: (1) areas where denture base resin shows through the VPS material, and (2) areas where VPS is excessively thick. In areas of show-through, the appropriate subtractive adjustment should be accomplished using acrylic resin laboratory rotary instrumentation. In areas where the VPS appears to be excessively thick, verify this thickness using a periodontal probe. The decision to repair a denture flange by adding thickness is based on the concept of improved retention and stability associated with physiologically developed denture flange contours.<sup>21,42,45</sup>

### **Repeat with Extra-Low-Viscosity VPS**

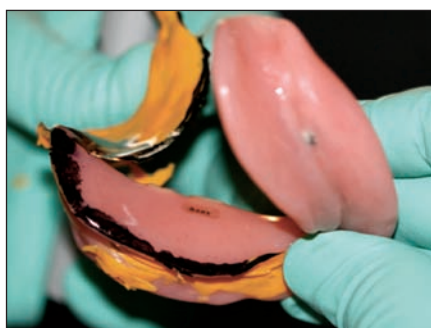
After the initial subtractive adjustments, a second application of VPS disclosing material is needed. For the second disclosing procedure, extra-low-viscosity VPS material is



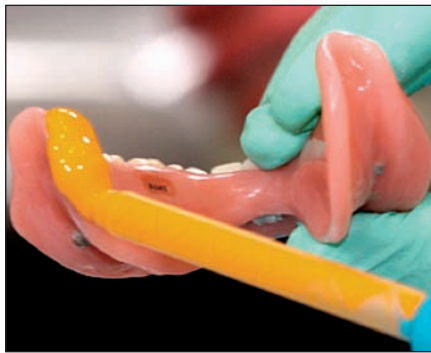
**Figure 12**—On removal of the denture, the external impression is inspected to identify areas of denture base show-through (arrows) and areas of excessive thickness.



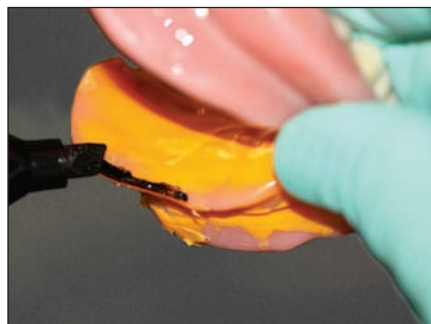
**Figure 14**—On removal of the denture, the external impression is again inspected to identify denture base show-through (arrows).



**Figure 16**—Removal of external impression material from the denture surface reveals the areas requiring adjustment indicated by black ink.



**Figure 13**—Reapplication of VPS is accomplished using extra-low-viscosity impression material along the same denture border as the initial application.



**Figure 15**—To improve visualization of areas requiring adjustment, the external impression is pointed with a nonpermanent black ink marker.



**Figure 17**—Appropriate adjustments are made using suitable rotary instrumentation.

selected to permit improved material flow (Figure 13). The procedures described above are again used. When the VPS is cured, remove the mandibular complete dentures and inspect the results (Figure 14). To better visualize the areas of resin denture base show-through, paint the VPS with a nonpermanent black ink marker (Figure 15). The ink marker can be spray-disinfected between uses. Next, peel away the VPS material and evaluate the ink markings on the denture surface (Figure 16). Make adjustments as indicated (Figure 17).

The disclosing and adjustment procedures are repeated until all required adjustments have been accomplished and the clinician and patient are satisfied with the results. Recall examinations should be scheduled to verify resolution of the patient's problems.

## Conclusion

This 3-part article presented a number of valuable applications of VPS impression material systems in modern dental practices. Part 1 of the series discussed making impressions for conventional complete denture therapy.<sup>46</sup> Part 2 reviewed the use of VPS impressions when fabricating immediate complete dentures and accom-

plishing complete denture reline procedures.<sup>47</sup> This article, Part 3, addressed the application of VPS impression systems during the fabrication of implant overdentures and the diagnostic evaluation and adjustment of all removable dental prostheses. VPS material performs well in these applications because of available viscosities and working times, a convenient delivery system, sequential layering ability, elasticity, tear strength, acceptable hydrophilicity, biocompatibility, and reasonable taste and smell. The techniques described here can be easily and successfully incorporated into any dental practice that involves the management of patients with removable prosthodontics.

## References

1. Berg E. The influence of some anamnestic, demographic, and clinical variables on patient acceptance of new complete dentures. *Acta Odontol Scand.* 1984;42:119-127.
2. Pietrokovski J, Harfin J, Mostavoy R, et al. Oral findings in elderly nursing home residents in selected countries: quality of and satisfaction with complete dentures. *J Prosthet Dent.* 1995; 73:132-135.
3. Geertman ME, Boerrigter EM, Van't Hof MA, et al. Two-center

- clinical trial of implant-retained mandibular overdentures versus complete dentures-chewing ability. *Community Dent Oral Epidemiol.* 1996;24:79-84.
4. Geertman ME, van Waas MA, van't Hof MA, et al. Denture satisfaction in a comparative study of implant-retained mandibular overdentures: a randomized clinical trial. *Int J Oral Maxillofac Implants.* 1996;11:194-200.
  5. Kapur KK, Garrett NR, Hamada MO, et al. Randomized clinical trial comparing the efficacy of mandibular implant-supported overdentures and conventional dentures in diabetic patients. Part III: comparisons of patient satisfaction. *J Prosthet Dent.* 1999;82:416-427.
  6. Raghoebar GM, Meijer HJ, Stegenga B, et al. Effectiveness of three treatment modalities for the edentulous mandible. A five-year randomized clinical trial. *Clin Oral Implants Res.* 2000;11:195-201.
  7. Awad MA, Lund JP, Dufresne E, et al. Comparing the efficacy of mandibular implant-retained overdentures and conventional dentures among middle-aged edentulous patients: satisfaction and functional assessment. *Int J Prosthodont.* 2003;16:117-122.
  8. Awad MA, Lund JP, Shapiro SH, et al. Oral health status and treatment satisfaction with mandibular implant overdentures and conventional dentures: a randomized clinical trial in a senior population. *Int J Prosthodont.* 2003;16:390-396.
  9. Feine JS, Carlsson GE. *Implant Overdentures: The Standard of Care for Edentulous Patients.* Chicago, Ill: Quintessence Publishing Company, Inc; 2003:155.
  10. Bergendal T, Engquist B. Implant-supported overdentures: a longitudinal prospective study. *Int J Oral Maxillofac Implants.* 1998;13:253-262.
  11. Batenburg RH, Raghoebar GM, Van Oort RP, et al. Mandibular overdentures supported by two or four endosteal implants. A prospective, comparative study. *Int J Oral Maxillofac Surg.* 1998;27:435-439.
  12. Rudd KD, Morrow RM, Feldmann EE. Final impression, boxing and pouring. In: *Dental Laboratory Procedures. Volume One: Complete Dentures.* 2d ed. Morrow RM, Rudd KD, Rhoads JE. St. Louis, Mo: The C.V. Mosby Company; 1986:57-79.
  13. Martone AL, Black JW. The phenomenon of function in complete denture prosthodontics. An approach to prosthodontics through speech science. Part V. Speech science research of prosthodontic significance. *J Prosthet Dent.* 1962;12:629-636.
  14. Pound E. Lost—Fine arts in the fallacy of the ridges. *J Prosthet Dent.* 1954;4:6-16.
  15. Wright CR, Swartz WH, Godwin WC. *Mandibular Denture Stability: A New Concept.* Ann Arbor, Mich: The Overbeck Company; 1961:29-31.
  16. Schole ML. Management of the gagging patient. *J Prosthet Dent.* 1959;9:578-583.
  17. Morstad AT, Peterson AD. Postinsertion denture problems. *J Prosthet Dent.* 1968;19:126-132.
  18. Means CR, Flenniken IE. Gagging: a problem in prosthetic dentistry. *J Prosthet Dent.* 1970;23:614-620.
  19. Kuebker WA. Denture problems: causes, diagnostic procedures, and clinical treatment. II. Patient discomfort problems. *Quintessence Int.* 1984;15:1131-1141.
  20. Kuebker WA. Denture problems: causes, diagnostic procedures, and clinical treatment. III/IV. Gagging problems and speech problems. *Quintessence Int.* 1984;15:1231-1238.
  21. Schiesser FJ. The neutral zone and polished surfaces in complete dentures. *J Prosthet Dent.* 1964;14:854-865.
  22. Beresin VE, Schiesser FJ. The neutral zone in complete dentures. *J Prosthet Dent.* 1976;36:356-367.
  23. Zarb GA, McGivney GP. Completing the rehabilitation of the patient. In: *Boucher's Prosthodontics Treatment for Edentulous Patients.* 11th ed. Zarb GA, Bolender CL, Carlsson GE, eds. St. Louis, Mo: Mosby-Year Book, Inc; 1997:358-389.
  24. Heartwell CM, Rahn AO. *Syllabus of Complete Dentures.* 4th ed. Philadelphia, Pa: Lea & Febiger; 1986:391-406.
  25. Gonzalez JB, Desjardins RP. Management of patients with new prostheses. In: *Diagnosis and Treatment in Prosthodontics.* Laney WR, Gibilisco JA, eds. Philadelphia, Pa: Lea & Febiger; 1983:506-535.
  26. Levin B. *Impression for Complete Dentures.* Chicago, Ill: Quintessence Publishing Company, Inc; 1984:13-34,101-130,159-191,193-216.
  27. Landesman HM. A technique for the delivery of complete dentures. *J Prosthet Dent.* 1980;43:348-351.
  28. Phoenix RD, DeFreest CF. An effective technique for denture border evaluation. *J Prosthodont.* 1997;6:215-217.
  29. Farley DW, Jones JD, Cronin RJ. Palatogram assessment of maxillary complete dentures. *J Prosthodont.* 1998;7:84-90.
  30. Firtell DN, Arnett WS, Holmes JB. Pressure indicators for removable prosthodontics. *J Prosthet Dent.* 1985;54:226-229.
  31. Muraoka H. *A Color Atlas of Complete Denture Fabrication: A Clinical Technique Using Interim Dentures.* Chicago, Ill: Quintessence Publishing Company, Inc; 1989.
  32. Wright SM. The polished surface contour: a new approach. *Int J Prosthodont.* 1991;4:159-163.
  33. Beresin VE, Schiesser FJ. *The Neutral Zone in Complete and Partial Dentures.* 2nd ed. St. Louis, Mo: The C.V. Mosby Company; 1978:158-183,221-233.
  34. Fahmy FM, Kharat DU. A study of the importance of the neutral zone in complete dentures. *J Prosthet Dent.* 1990;64:459-462.
  35. Mathews EA. Residual problems in full denture prosthesis. *British Dental Journal.* 1954;97:167-173.
  36. Merkeley HJ. Mandibular rearmament. Part II. Denture construction. *J Prosthet Dent.* 1959;9:567-577.
  37. Raybin NH. The polished surface of complete dentures. *J Prosthet Dent.* 1963;13:236-239.
  38. Tryde G, Olsson K, Jensen SA, et al. Dynamic impression methods. *J Prosthet Dent.* 1966;15:1023-1034.
  39. Lott F, Levin B. Flange technique: an anatomic and physiologic approach to increased retention, function, comfort, and appearance of dentures. *J Prosthet Dent.* 1966;16:394-413.
  40. Heath R. A study of the morphology of the denture space. *Dent Pract Dent Rec.* 1970;21:109-117.
  41. Bocage M, Lehrhaupt J. Lingual flange design in complete dentures. *J Prosthet Dent.* 1977;37:499-506.
  42. Levin B. Current concepts of lingual flange design. *J Prosthet Dent.* 1981;45:242-252.
  43. Neill DJ, Glaysher JK. Identifying the denture space. *J Oral Rehabil.* 1982;9:259-277.
  44. Martone AL. The phenomenon of function in complete denture prosthodontics. Clinical applications of concepts of functional anatomy and speech science to complete denture prosthodontics. Part VI. The diagnostic phase. *J Prosthet Dent.* 1962;12:817-834.
  45. Fish EW. An analysis of the stabilizing force in full denture construction. *British Dental Journal.* 1931;52:559-570.
  46. Massad JJ, Cagna DR. Vinyl polysiloxane impression material in removable prosthodontics. Part 1: Edentulous Impressions. *Compend Contin Educ Dent.* 2007;28:452-460.
  47. Cagna DR, Massad JJ. Vinyl polysiloxane impression material in removable prosthodontics. Part 2: Immediate denture and relined impressions. *Compend Contin Educ Dent.* 2007;28:519-527.