Spacer Designs for Impression technique in Conventional Complete Denture.

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Abstract :

One of the key factors for the success of a complete denture prosthesis is the accurate recording of all the details in the impression procedures . Various impression philosophies have been proposed till date. Amongst all, the selective-pressure impression technique is most widely accepted. In this technique, custom tray having spacers of different materials, size and designs is fabricated. Depending on the vulnerable tissues they are relieved and stresses are distributed selectively to biomechanically stress bearing sound tissues.

Through knowledge of the anatomy, with biological consideration of the vulnerable tissues and understanding the properties of materials used in the fabrication is must for making custom impression tray. Adequate extension with required thickness and designs of spacer, tissue stops, escape holes, tray handles, and polymerization time regarding custom impression trays in prosthodontics should be considered. This article will give a clear review to the dentists regarding different types of spacer design, material and thickness of the spacers, tissue stops, and escape holes by various authors, based on various clinical situations .
Keywords: Spacer designs; Impression philosophies; Impression procedures ; Pressure technique ; Selective pressure impression.

Introduction : Impression making for complete denture dates back to an era when wood or ivory blocks were carved to accommodate the intraoral contours. Advanced techniques are being used because of a thorough knowledge of the oral tissues and their reaction to the use of various materials, methods and manipulation of the materials used for making impressions. The need to make an accurate impression is fundamental to the practice of prosthodontics and ultimately to the success of the prosthesis.

Basic impression philosophies for impression techniques are:

According to pressure technique impression procedure are grouped as :

- Mucocompressive,
- Mucostatic,
- Minimal pressure, and
- Selective-pressure impression [1-4].

Mucocompressive impression technique records tissues in their functional forms to provide denture stability during function. This technique is not very encouraging as it will lead to continuous pressure, resulting in residual ridge resorption. It will also compromise denture retention, as the displaced tissue during function tends to rebound at rest. This theory was proposed by Green Brothers in 1907.

Mucostatic impression technique records denture-bearing tissues in static, undisturbed form by using readily flowing material such as impression plaster. Disadvantage is that due to the lack of sufficient coverage of denture-bearing area, the denture will have poor retention, stability, and aesthetic appearance. This theory was proposed by H L Page in 1938.

Minimal-pressure technique is a compromise between mucostatic and mucocompressive techniques. In this technique, the minimal possible pressure, i.e., little more than the weight of free-flowing material is applied during recording denture-bearing tissues. Limitation is that there is lack of standardized protocol regarding the amount of pressure to be applied during impression.

Selective-pressure impression concept combines the merits of minimal pressure and mucocompressive philosophies. This technique was proposed by Carl O. Boucher in and is most widely accepted.[2] The spacer design for Selective-pressure impression technique is directly governed by the knowledge of the stress-bearing areas and relief areas of the denture foundation. Selective pressure can be achieved either by scraping of the primary impression in selected areas or by fabrication of a custom (special) tray with a proper spacer design and providing escape holes (relief).[5] The latter is more reliable because of the accuracy with which we can achieve variable thickness in the impression material due to the variable thickness of wax spacer and thereby achieve variable compression of tissues at different areas (selective pressure at selected areas). Limitation is that there is inadequate knowledge of custom-impression tray design among clinicians and

most of the clinicians depend upon lab technicians to design them.

Classification of Spacer Designs [6,13,14]

Full spacers cover the entire residual ridge except PPS area in maxilla and buccal shelf and retromylohyoid area in the mandible. This provides space for impression material.

Partial spacers, like I-spacer and T-spacer, cover specific tissues based on different clinical situations.

Spacers with tissue stops have windows of 2 mm width cut at canine and molar regions bilaterally. Tissue stops will help in proper vertical seating of the impression tray, and control the thickness of the impression material.

Spacer Thickness

Ideal thicknesses of wax spacer for completely edentulous and partially edentulous situations are 1 and 3 mm, respectively. The thickness of spacer is determined by the type of impression material in the making of final impression and clinical situation as given in (Table 1).

Clinical situation	Impression material	Spacer design & thickness
Nonundercut ridges	1. Impression plaster 2. Zinc oxide eugenol	2 mm spacer with tissue stops 0.5 mm spacer
Nonundercut and undercut ridges	1. Alginate 2. Elastomeric impression materials: a. Polysulfide b. Silicones	3 mm spacer with tissue stops 1.5 mm spacer with tissue stops 3 mm spacer
Displaceable tissues	ZOE paste, impression plaster and various elastomers	Spacer design and thickness variable based on clinical situation

(Table 1).

Spacer Materials[18,19,20]

Tin foil, first recommended by Roy Mac Gregory in the region of incisive papilla and midpalatine raphe.

Casting wax in thickness of 0.9 mm advocated by Neil and to be adapted all over except PPS area.

Nonasbestos ring liner (wet) used as spacer when shellac is used for custom tray fabrication.

Base-plate wax used as spacer when acrylic resin is used for custom tray fabrication.

Spacer Designs :

Carl O. Boucher : For selective-pressure impression technique ,for maxillary tray he advocated the placement of 1 mm base-plate wax as spacer on the entire basal seat area except posterior palatal seal (PPS) area. According to him PPS will act as guiding stop to position the tray properly during impression procedures. He also advocated the placement of escape holes with number 6 round bur in the palatal region. For mandibular tray he advocated the placement of 1 mm thick base-plate wax as spacer to cover the whole mandibular ridge except in buccal shelf area and retromolar pad (Figure 1) [1-3].

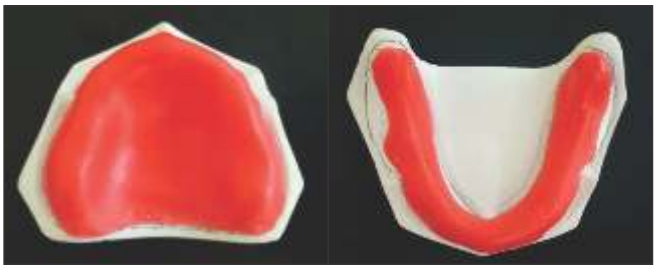


Figure 1: Boucher's spacer design

Morrow, Rudd, and Rhoads: based on minimal-pressure technique, recommends blocking out the undercut areas with wax and then adapting a full wax spacer 2 mm short of the resin special tray border all over. They also recommended placement of three tissue stops of size 4 mm in width and 4 mm equidistant from each other[4] **(Figure 2).**

Figure 2: Morrow, Rudd, and Rhoads' spacer design

Sharry J J : based on minimal-pressure technique recommends adaptation of a layer of base-plate wax as spacer over the whole area outlined for tray (even in PPS area). He recommends the placement of four tissue stops of size 2 mm in width located in molar and cuspid regions which should extend from palatal aspect of the ridge to the mucobuccal fold and one vent hole in the incisive papilla region before making the final impression with the metallic oxide impression material. He recommends full spacer 2 mm short all over except in buccal shelf area and a window for tissue stop in midline of the mandibular ridge for mandibular custom tray (Figure 3)[5,7].

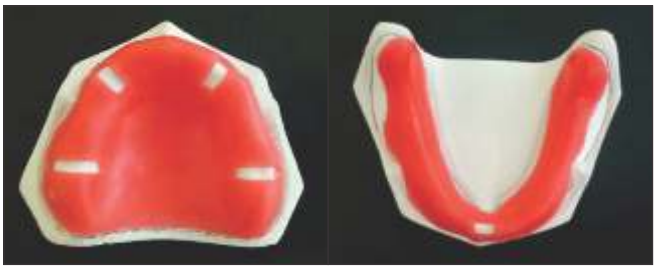


Figure 3: J. J. Sharry's spacer design

Bernard L : based on selective pressure technique, recommends a layer of pink base-plate wax about 2 mm thick spacer on the areas of the cast that usually have the areas of softer tissues. He recommends the placement of wax spacer all around, except in the posterior part of the palate for maxillary tray, which according to him are at high angles to the occlusal forces. [8](Figure 4).

Figure 4: Bernard and Levin's spacer design

Halperin G: recommends the "custom tray" with peripheral relief. The peripheral extensions and buccal slope regions of tray including posterior palatal seal region and that the custom tray should be in intimate contact with basal seat areas. This provides the internal finish line that forms a butt joint of the compound to the tray after border molding is completed. No secondary wash impression is needed as tray surface and border-molded areas acts as final impression surface. A master cast is directly poured into border molded trays without using wash impression [9] (Figure 5).

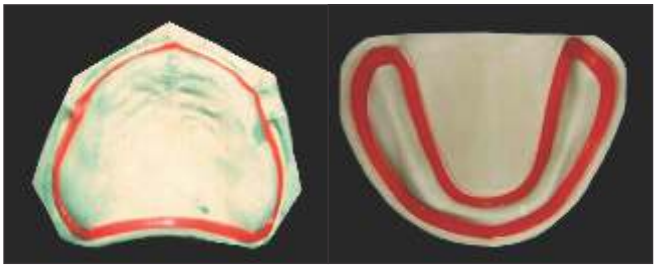


Figure 5: Halperin's spacer design

Roy Mac Gregor: based on selective pressure technique, recommends placement of a sheet of metal foil in the region of incisive papilla and midpalatine raphe. He also states that the other areas that may require relief are maxillary rugae, areas of mucosal damage, and buccal surface of the prominent tuberosities. According to him the relief should not be used routinely in the dentures [10] (Figure 6).

Figure 6: Roy Mac Gregor's spacer design

Neill : recommends the adaptation of 0.9 mm casing wax all over except in the PPS area[11] (Figure 7).

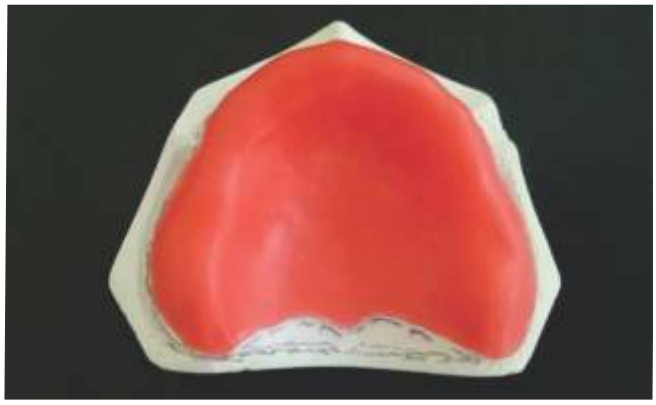
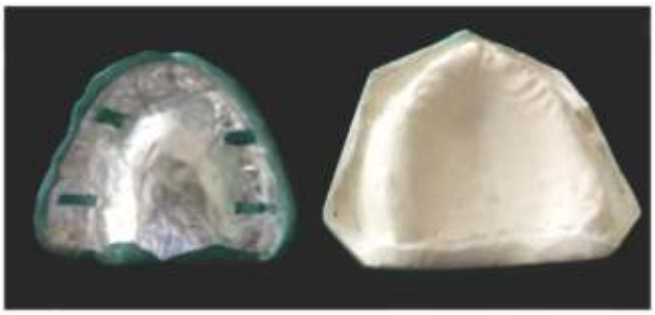


Figure 7: Neil's spacer design

Heartwell : mentions two techniques for achieving selective pressure for maxillary impressions. In the first technique, he makes the primary impression with impression compound in a non-perforated stock tray; the borders of the impression are refined. Later, space is provided in selected areas by scraping of the impression compound. In the second technique, he recommends the fabrication of a custom tray (but did not mention about the wax spacer). Border molding is done with low fusing compound. He recommends the placement of five relief holes on the palatal region (three in the rugae area and two in the glandular region) before making the secondary impression with Zinc Oxide Eugenol (ZOE) impression paste [12]. (Figure 8)



Sheldon : describes two techniques. In the first technique, primary impression is made with low-fusing modelling compound (Kerr white cake compound). The borders are refined with Kerr greenstick compound. Once the operator is satisfied with the retention, selective relief is accomplished by scraping in the region of incisive papilla, rugae, and mid palatal areas (Figure 9). In the second technique, he describes of making an alginate primary impression. A primary cast is poured after analysis of cast contours, undercuts are blocked out. Later, he recommends the placement of spacer for pressure control (but did not mention clearly about the wax spacer design). Border molding is done with green stick compound before making the secondary impression with ZOE paste based on selective-pressure technique used on high arched palate. [13] (Figure 9).

Figure 9 : Sheldon's spacer design

Sanath Shetty : described a technique in which a thin sheet of wax (0.4 mm major connector wax [Renfert, Germany]) is required to be placed in all areas except the PPS area, as this area needs to be compressed during the border-molding procedures. A 1.5 mm thick layer of modelling wax is applied on top of the already adapted wax sheet. The modelling wax is removed in the region of the crest of the alveolar ridge and the horizontal palate, as these are stress-bearing areas [14] (Figure 10).

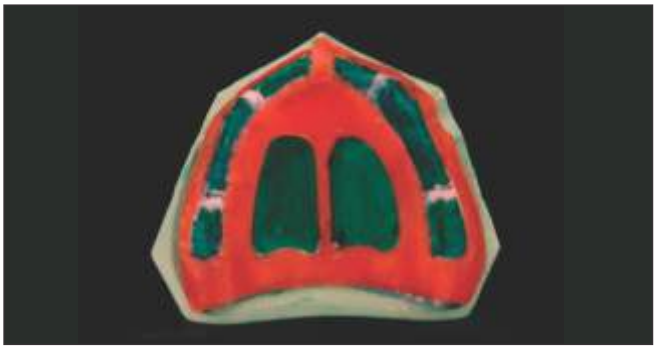


Figure 10: Sanath Shetty's spacer design

Dale E Smith : 1 mm thick base-plate wax covers the ridge and midpalatine raphe. Two tissue stops, each at the canine region and exposed hard palate, help in proper vertical seating of the tray and control the thickness of impression material [15] (Figure 11).

Figure 11: Dale E. Smith's spacer design

Spacer Design for special undesirable clinical situation.

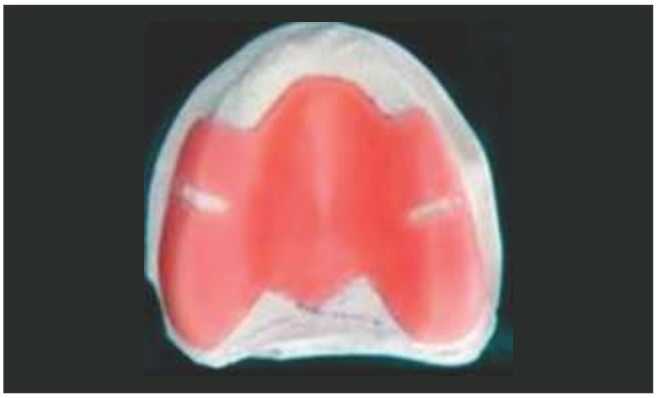
I-spacer in maxillary arch, based on selective-pressure technique, covers the incisive papilla and midpalatine raphe when it is prominent. (Figure 12).

T-spacer covers the anterior residual alveolar ridge in maxilla when it is resorbed and flabby. It is based on selective-pressure technique; it also covers the prominent incisive papilla, rugae and midpalatine raphe, and the exposed areas act as stoppers. Partial spacer designs in the mandible cover only the anterior residual alveolar ridge when it is atrophic, resorbed, or flabby [21-24]. This is based onselective-pressure technique; the spacer placed on relieving areas and the exposed areas acts as stoppers. Figure 12

I-spacer Figure 12

T-spacer (Figure 13).

Window spacer design for Flabby ridge cases [25,26] – (Figure 14).



Window spacer (Figure 14).

U-spacer design for mandibular anterior resorbed or flabby ridge – (Figure15)

U-spacer (Figure 15)

Discussion : As well said by M.M.De Van, "Preservation of what remains is more important than meticulous replacement of what is lost", same is applicable to complete denture impressions. Proper knowledge of spacer design and its application during impression making is of utmost importance for stable, retentive prostheses that should be in harmony with surrounding and underlying tissues.

Conclusion : One must apply pressure selectively only in certain areas, which can withstand the forces of mastication to minimize the possibility of soft-tissue abuse and bone resorption. This review shows that a wide range of spacer design is available for different situations. Based on the particular condition, a dentist needs to select proper spacer design for impression technique and for the success of complete denture prosthesis.

References :

1. Boucher CO A critical analysis of mid-century impression techniques for full dentures. J Prosthet Dent 1951 1: 472-490.
2. Zinner ID, Sherman H An analysis of the development of complete denture impression techniques. J Prosthet Dent 46: 242-249. (1981)
3. Zarb GA, Bolender CL, Carlsson GE (1999) Boucher's Prosthodontic Treatment for Edentulous Patients. 11th ed. St. Louis, MO: Mosby, pp. 3123-3123.
4. Morrow RM, Rudd KD, Rhoads JE (1986) Dental Laboratory Procedures, Complete Dentures, Vol. 1, 2nd ed. Toronto: CV Mosby, pp. 26-56.
5. Hickey JC, Zarb GA, Bolender CL (1985) Bouchers Prosthodontic Treatment for Edentulous Patients. 9th ed. St. Louis, MO: CV Mosby Company, 119-230.
6. Grant AA, Heath JR, McCord JF (1992) Complete Prosthodontics. London: Mosby-Year Book Europe Limited, pp. 89-93.
7. Sharry JJ (1974) Complete Denture Prosthodontics, 3rd ed. New York: Blakiston, pp. 191-210.
8. Bernard L (1984) Impressions for Complete Dentures. Chicago, IL: Quintessence, pp. 71-90.
9. Halperin G, Rogoff P (1988) Mastering the Art of Complete Dentures. Chicago, IL: Quintessence, pp. 43-51.
10. Mac Gregor Roy A (1994) Fenn, Liddelow and Gimson's Clinical Dental Prosthetics, 3rd ed. Oxford: Wright, Butterworth, pp. 43-77.
11. Neill DJ, Nairn RI (1990) Complete Denture Prosthetics, 3rd ed. London: Wright, pp. 22-26.
12. Rahn AO, Heartwell CM (2002) Text Book of Complete Dentures, 5th ed. India: Elsevier Science, pp. 221-247.
13. Sheldon W (1996) Essentials of Complete Denture Prosthodontics, 2nd ed. Philadelphia, PA: Ishiyaku Euro America, pp. 88-106.
14. Shetty S, Nag PVR, Shenoy KK (2007) A review of the techniques and presentation of an alternate custom tray design. JIPS 7: 8-11.
15. Smith PW, Richmond R, McCord JF (1999) The design and use of special trays in prosthodontics: guidelines to improve clinical effectiveness. Br Dent J 187: 423-426.
16. Herekar M, Sethi M, Fernandes A, Kulkarni H (2013) A physiologic impression technique for resorbed mandibular ridges. J Dent Allied Sci 2: 80-82. 17. Frank RP (1969) Analysis of pressures produced during maxillary edentulous impression procedures. J Prosthet Dent 22: 400-413.
17. Ohkubo C, Watanabe I, Tanaka Y, Hosoi T (2003) Application of cast iron— platinum keeper to a collapsible denture for a patient with constricted oral opening- a clinical report. J Prosthet Dent 90: 6-9.
18. 15. Smith PW, Richmond R, McCord JF . The design and use of special trays in prosthodontics: guidelines to improve clinical effectiveness. Br Dent J 1999;187: 423-426.
19. 16. Herekar M, Sethi M, Fernandes A, Kulkarni H (2013) A physiologic impression technique for resorbed mandibular ridges. J Dent Allied Sci 2: 80-82. 17. Frank RP (1969) Analysis of pressures produced during maxillary edentulous impression procedures. J Prosthet Dent 22: 400-413.
20. Baker PS, Brandt RL, Boyajian G (2000) Impression procedure for patients with severely limited mouth opening. J Prosthet Dent 84: 241-244.
21. Geckili O, Cilingir A, Bilgin T (1982) Impression procedures and construction of a sectional denture for a patient with microstomia: A clinical report. J Prosthet Dent 96: 387-390.
22. Luebke RJ Sectional impression tray for patient with constricted oral opening. J Prosthet Dent 1984; 52: 135-137.
23. Giordano R Materials for chair side CAD/CAM—produced restorations. J Am Dent Assoc 2006 ;137: 14-21.
24. Christensen GJ Will digital impressions eliminate the current problems with conventional impressions? J Am Dent Assoc 2008 ;139: 761-763.
25. Astagi PB, Gangadhar SA, Bhandhari Aruna J et al Management of a flabby tissue by window technique : A clinical case. Pravara Med Review 2014:6(1);14-16 Yogesh Sonawne, Gangadhar SA, Bhandhari Aruna J et al – Grab the flab Window impression technique – a case report. IOSR J dental and medical sciences, 2013:11(4);39-42.