Short Communication

Dimensional Contour Stability of Acrylic Resin Bases for Complete Dentures Before and After Water Sorption

Sandro Barone Monfrin, DDS[a]/Vincenzo Notaro, DDS[b]/Gianfranco Gassino, MD, DDS[c]/
Roberto Perotti, MD, DDS[d]/Francesco Bassi, MD, DDS[e]

Purpose: To evaluate the dimensional contour variations of acrylic resin denture bases before and after storage in water. ***Materials and Methods:*** The fit of 40 bases was evaluated by measuring the thickness of a layer made with silicone placed between the bases and the casts. The measurements were repeated on a new set of silicone layers after having stored the bases in water for 42 days. ***Results:*** Significant differences were found both for the maxillary and the mandibular bases. ***Conclusion:*** Water sorption had an important effect on the contour of the prosthetic bases.
Int J Prosthodont 2005;18:480–482.

Accurate reproduction of the edentulous ridges and dimensional stability of acrylic resin bases are important in the creation of complete dentures that function correctly.[1] A technical step that produces a relatively large dimensional change is the processing of the bases.[2,3] Furthermore, changes in the dimensional stability of the bases as a result of water sorption have been reported.[3–5]

Zissis et al[1] stated that the effect of contraction on denture shape and contour is unlikely to be linear; consequently, measuring techniques should evaluate surface contour changes between the cast and the denture base rather than simple linear contraction. Therefore, the present study evaluated the dimensional contour variations of maxillary and mandibular acrylic resin complete denture bases, molded with different techniques and using different resins, before and after immersion in water.

Materials and Methods

So that an unalterable cast was created during the laboratory phases, maxillary and mandibular edentulous ridge Type III stone casts (Hydrocal, Kerr) were covered with a chromium-cobalt alloy (Dentorium) casting. Following the manufacturers' instructions, 40 denture bases (20 maxillary and 20 mandibular) were molded using 10 different types of resin (Table 1). A 2-mm-thick vinyl resin base (Brega-Effegi) was adapted on the casts to create an adequate and constant space in the upper part of the flasks. All the bases made with the compression technique were molded using the same flask (SAED). The bases made with the injection technique were molded using different flasks (FRP-GC, Ivocap, Schutz-Dental). After the resins had polymerized, the bases were finished off with burs for resin (Sweden & Martina) and then polished with a bench-type polishing lathe (Viganò).

The fit of the bases was evaluated by measuring the thickness of a layer made of low-density silicone (Elite H-D, Zhermack) placed between the bases and the

[a]*Lecturer, Department of Prosthodontics, School of Dentistry, University of Turin, Italy.*
[b]*Tutor, Department of Prosthodontics, School of Dentistry, University of Turin, Italy.*
[c]*Assistant Professor, Department of Prosthodontics, School of Dentistry, University of Turin, Italy.*
[d]*Professor, Section of Dental Materials, School of Dentistry, University of Turin, Italy.*
[e]*Professor, Department of Prosthodontics, School of Dentistry, University of Turin, Italy.*

Correspondence to: *Dr Francesco Bassi, Università di Torino, Dipartimento di Scienze Biomediche e Oncologia Umana, Sezione di Riabilitazione Orale e Protesi Maxillo-Faciale, Cattedra di Protesi Dentaria. Corso Dogliotti 14, 10126 Torino, Italy. Fax: +39-011-6636489. E-mail: f.bassi@onw.it*

Table 1 Resins Selected for the Study

Brand name	Manufacturer	Polymerization technique	Molding
Paladon	Heraeus Kulzer	Self polymerizing	Compression
Probase	Ivoclar	Self polymerizing	Compression
Palapress	Heraeus Kulzer	Self polymerizing	Compression
Orthojet	Lang Dental	Self polymerizing	Compression
Paladon	Heraeus Kulzer	Heat polymerizing	Compression
Probase	Ivoclar	Heat polymerizing	Compression
Lucitone 199	Densply/Caulk	Heat polymerizing	Compression
Acron MC	GC Europe	Microwave polymerizing	Injection
Futura Jet	Schutz-Dental	Self polymerizing	Injection
SR-Ivocap	Ivoclar	Heat polymerizing	Injection

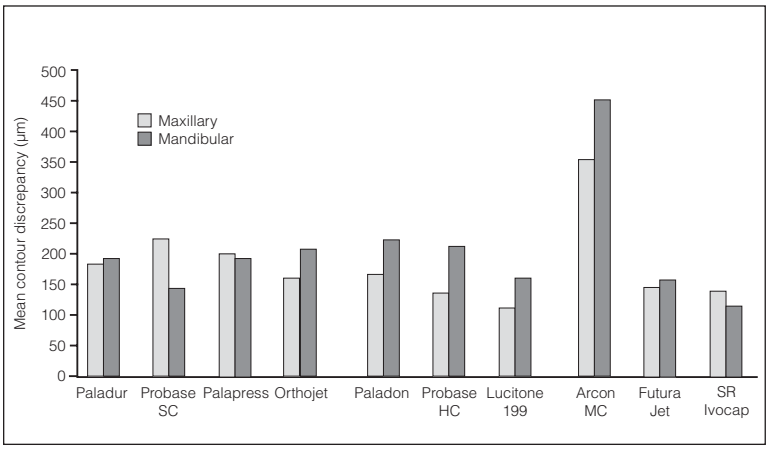

Fig 1 Mean measurements of contour descrepancies of the resin bases after polymerization.

Table 2 Mean Measurements (in µm) of Contour Discrepancies of Resin Bases After Polymerization

Resin	Maxilla	Mandible
Paladur	181.2	191.2
Probase SC	222.3	141.2
Palapress	198.0	189.2
Orthojet	159.6	204.0
Paladon	166.2	220.1
Probase HC	133.6	210.7
Lucitone 199	109.9	158.6
Acron MC	353.6	450.0
Futura Jet	143.8	155.5
SR-Ivocap	138.0	114.1

SC = self curing; HC = heat curing.

casts and made to set under 2.5 kg of pressure. The force was always applied at the same spot: in the center of the palate for the maxillary bases and on the lateral ridges for the mandibular bases. The silicone layers were separated from the bases and their thickness was measured with an electronic micrometer (± 1 m precision) (Moore & Wright) at the contour level at 5 points on the maxillary casts (2 at the tuberosities, 1 at the posterior palatal seal, and 2 at the fornices of the canine regions) and at 6 points on the mandibular casts (2 at the retromolar pads, 2 at the mylohyoid ridges, and 2 at the fornices of the canines). The measurements were repeated on a new set of silicone layers and obtained via the above-mentioned protocol after the bases had been stored in water at room temperature for 42 days.

All the measurements were taken by the same operator. Data were analyzed statistically by means of the Student *t* test.

Results

The mean measurements of the 40 silicone layers obtained after polymerization (Fig 1, Table 2) and after water sorption (Fig 2, Table 3) showed significant differences ($P = .0001$). The differences in the means of the thickness values of both the 20 maxillary and 20 mandibular silicone layers before and after water sorption were also statistically significant ($P = .0018$ and $P = .0032$, respectively). The various types of acrylic resin underwent inconstant contour dimensional variations (Fig 3, Table 4).

On the whole, the maxillary bases had a better average contour fit than the mandibular bases. However, no statistically significant differences were found when analyzing the discrepancies between the maxillary and the mandibular silicone layers before water sorption ($P = .088$) and the maxillary and the mandibular layers after water sorption ($P = .675$).

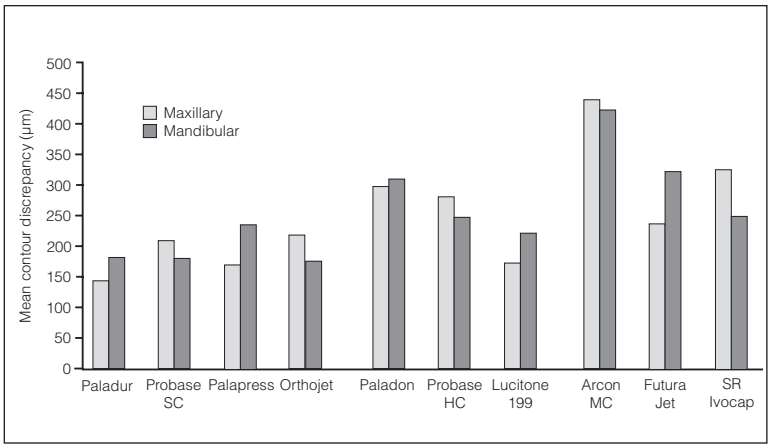

Fig 2 Mean measurements of contour discrepancies of the resin bases after water sorption.

Table 3 Mean Measurements (in µm) of Contour Discrepancies of Resin Bases After Water Sorption

Resin	Maxilla	Mandible
Paladur	141.3	181.9
Probase SC	207.03	177.8
Palapress	167.5	233.3
Orthojet	214.2	175.5
Paladon	296.4	307.6
Probase HC	277.1	244.0
Lucitone 199	169.9	219.1
Acron MC	439.4	422.8
Futura Jet	235.8	317.8
SR-Ivocap	325.0	245.5

SC = self curing; HC = heat curing.

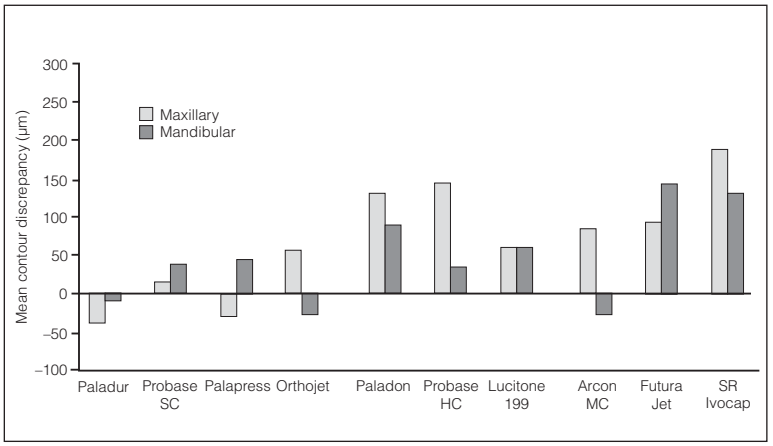

Fig 3 Differences between the mean measurements of contour discrepancies after polymerization and after water sorption.

Table 4 Differences Between Mean Measurements of Contour Discrepancies After Polymerization and Water Sorption

Resin	Maxilla	Mandible
Paladur	−39.9	−9.1
Probase SC	15.3	36.5
Palapress	−30.5	44.0
Orthojet	54.6	−26.5
Paladon	130.2	87.5
Probase HC	143.5	33.3
Lucitone 199	60.0	60.5
Acron MC	85.8	−27.1
Futura Jet	92.0	143.3
SR-Ivocap	187.0	131.3

SC = self curing; HC = heat curing.

Conclusion

Within the limits of this investigation, the following conclusions may be drawn:

1. Water sorption had an important effect on the contour of the prosthetic bases. The mean of the contour measurements of the 40 resin bases before and after water sorption showed significant differences ($P = .0001$). The differences in precision of the contour of the 20 maxillary bases and of the 20 mandibular bases before and after water sorption were also statistically significant ($P = .0018$ and $P = .0032$, respectively).
2. The shape of the bases did not seem to have an important effect on the dimensional contour variations. No statistically significant differences were found when analyzing the contour discrepancies between the maxillary and the mandibular bases before or after water sorption.

References

1. Zissis A, Huggett R, Harrison A. Measurement methods used for the determination of dimensional accuracy and stability of denture base materials. J Dent 1991;19:199–206.
2. Takamata T, Setcos JC. Resin denture bases: Review of accuracy and methods of polymerisation. Int J Prosthodont 1989;2:555–562.
3. Wong DM, Cheng LY, Chow TW, Clark RK. Effect of processing method on the dimensional accuracy and water sorption of acrylic resin dentures. J Prosthet Dent 1999;81:300–304.
4. Soni PM, Powers JM, Craig GR. Comparison of the accuracy of denture base by a nonparametric method. J Oral Rehabil 1979;6:35–39.
5. al-Mulla MA, Murphy WM, Hugget B, Brooks SC. Effect of water and artificial saliva on mechanical properties of some denture-base materials. Dent Mater 1989;5:399–402.