Journal of Advanced Medical and Dental Sciences Research

Journal home page: www.jamdsr.com doi: 10.21276/jamdsr

(e) ISSN Online: 2321-9599; (p) ISSN Print: 2348-6805 SJIF (Impact factor) 2017= 6.261; Index Copernicus value 2016 = 76.77

Original Article

Evaluation of Additional Silicone and Condensational Silicone for the Precision for Duplicating Master Dies: A Comparative Study

Parvinder Singh Baweja[1], Gurpreet Kaur Baweja[2], Ekta Suneja[3], Bharat Suneja[4]

[1]Reader, Department of Conservative Dentistry, [2]Reader, Department of Prosthodontics, [3]Prof & HOD, Department of Conservative Dentistry , [4]Prof & HOD, Department of Pedodontics, BJS Dental College, Ludhiana, Punjab, India

***ABSTRACT*:**
Background: Achieving optimum function and esthetic of restorations is very important, especially in replacing a missing tooth. Several elastic impression material silicones are available for dental use: Synthetic elastomeric materials (polysulfide [PS], additional silicone [AS] and condensational silicone [CS], and polyether [PE]); and hydrocolloids. Hence, the present study was conducted to compare additional silicone and condensational silicone for the precision for duplicating master dies. **Materials & methods:** In the present study, we prepared an acrylic model of lower 1st molar tooth on the basis of conventional shoulder type marginal preparation, supragingivally. Two master dies were made by both impression materials. A total of 20 successive impressions were then made, ten for each of the two impression material. The marginal discrepancy was recorded in both the study groups. All the results were analyzed by SPSS software. **Results:**Significant results were obtained while comparing the mean discrepancy in between duplicated die and model in the condensation silicon group. **Conclusion:** In comparison to condensation silicone, additional silicone is a better impression material.
Keywords: Additional silicone, Condensational silicone.

Received: 28 November 2017 Revised: 15 December 2017 Accepted: 20 December 2017

Corresponding author: Dr. Parvinder Singh Baweja, Reader, Department of Conservative Dentistry, BJS Dental College, Ludhiana, Punjab, India

This article may be cited as: Baweja PS, Baweja GK, Suneja E, Suneja B. Evaluation of Additional Silicone and Condensational Silicone for the Precision for Duplicating Master Dies: A Comparative Study. J Adv Med Dent Scie Res 2018;6(1):14-16.

INTRODUCTION:

Achieving optimum function and esthetic of restorations is very important, especially in replacing a missing tooth. Furthermore, temporary restorations are essential for preservation of the tooth structure in the meantime of preparing cast models.[1, 2]Marginal adaptation of a cast restoration can influence its durability due to: Lower accumulation of plaques in margins, enhancing structural properties (stability, resistance, low thickness of cement, and etc.), and higher esthetics.[3, 4]

There are several factors which can affect the accuracy of definitive impression like: Quality of preparation (undercuts and tapering), impression technique, soft tissue management, and quality of wax pattern and casting.[5]

Several elastic impression material silicones are available for dental use: Synthetic elastomeric materials (polysulfide [PS], additional silicone [AS] and condensational silicone [CS], and polyether [PE]); and hydrocolloids. PE and silicones are accurate with high stability. They can maintain their accuracy even 1-week or later, however, they are technique sensitive; for instance PE should be stored in <50% humidity.[6- 9] Hence, the present study was conducted to compare additional silicone and condensational silicone for the precision for duplicating master dies.

MATERIALS AND METHOD:

The present study was planned in the department of Prosthodontics and conservative dentistry of the dental institution. The ethical clearance for the study protocol was obtained from the ethical committee of the instituteafter explaining in detail the entire research protocol. For the study, we prepared an acrylic model of lower 1st molar tooth on the basis of conventional shoulder type marginal preparation, supragingivally. On mesial, distal, lingual, and buccal surfaces of the model beneath the margins for making measuring guidelines, some grooves were prepared. Two step impression techniques were administered for both techniques. Two master dies were made by these impression

materials. A total of 20 successive impressions were then made, ten for each of the two impression material. Dies were fabricated with the same procedure as already described, and the same stone and delays. These dies were assumed as the test duplicate dies. The marginal discrepancy was recorded in both the study groups. All the results were analyzed by SPSS software. Chi-square test was used for assessment of level of significance. P- value of less than 0.05 was taken as significant.

RESULTS:

Significant results were obtained while comparing the mean discrepancy in between duplicated die and model in the condensation silicon group. However; in the addition silicon group, non- significant results were obtained.

Chen SY et al evaluated the effects of (1) various impression materials, (2) different storage times and (3) the proportion of inorganic filler on the accuracy and stability of elastometric impression materials. The impression materials studied included three alginate impression materials (Algiace Z, CAVEX and Jeltrate), five commercial silicone impression materials (Aquasil, Exaflex regular type, Express, Coltex fine and Rapid liner) and two experimental silicone impression materials designed for this study (KE106A and KE106B). Impressions were made of 10 metal dies that mimicked prepared crowns. After an impression was taken, dental stone was immediately poured into the alginate impressions, while the silicone impressions was poured 30 min later and waited for 1 h for setting.

Table 1: Mean discrepancies of various margins (um) prepared by different impression materials

Type of impression material		Mean discrepancies of various margins compared to original model (um)					p-value
		Buccal	Lingual	Mesial	Distal	Overall	
Addition silicone	**Duplicated die**	30.41	34.15	36.88	36.15	34.66	**0.22**
	Model	29.22	31.22	29.24	35.97	33.11	
Condensation silicone	**Duplicated die**	36.14	35.81	38.15	38.39	39.71	**0.01***
	Model	30.28	30.20	37.15	34.17	35.22	

*: Significant

DISCUSSION:

In the present study, we noticed that overall discrepancy was more in model fabricated from condensation silicone as compared to additional silicone. Ratnaweera PM et al evaluated the dimensional accuracy of several impression methods including agar alginate combined impression in vivo; the marginal accuracy of stone dies was determined using a new electroformed master crown technique. Cast cores with knife-edge and chamfer margins and electroformed master crowns were fabricated for 3 patients. Five impressions were taken of each preparation, using agar alginate combined impression and silicone impression materials. Dies were made after impression. The marginal fit of the master crown on each die was analyzed by four-way analysis of variance (ANOVA) and Tukey HSD test ($p<0.05$). The marginal fit of the master crown on the dies with chamfer margin was better than those with knife-edge margin for agar alginate combined impression. The shape of the margin did not affect the accuracy when silicone impression material was used. The results suggested that the agar alginate impression method is clinically acceptable for the chamfer margin, but shape of the margin may affect the dimensional accuracy of dies. The shape of the margin does not affect the accuracy of dies when silicone impression was used. Furthermore, the master crown made by electroforming technique could be useful for clinical evaluation of impression methods.[10]

The second and third stone dies were made 1 and 24 h later, respectively.

The diameters of the occlusal surfaces of the metal dies and stone casts were determined using photographs of the surfaces taken with a Kodak DC 290 digital camera. The pictures were then measured using a photomicrograph digitized integration system to calculate any discrepancy. Because each impression was used to make three rounds of stone dies, two-factor mixed factorial ANOVA was used to evaluate the effect of materials and storage time on the accuracy of the stone casts. The simple effects analysis, combined with multiple comparisons considering the per family type I error rate, was performed following confirmation that an interaction between the two factors was significant. The results showed that: (1) there was a significant interaction effect between materials and storage times on the accuracy of the impressions. (2) Two addition type silicone materials, Aquasil and Exaflex, had the greatest accuracy and stability. (3) The experimental material KE106A had the least accuracy in the first and second rounds and the alginate impression material CAVEX had the least accuracy in the third round. (4) The stabilities of CAVEX and Jeltrate were the least consistent of the 10 materials and decreased significantly with storage time. (5) When the experimental material had a low proportion of filler (KE106A), there was a significantly greater dimensional discrepancy compared to the same material

with a higher proportion of filler (KE106B). The accuracies varied among the 10 impression materials over three rounds. Of all the materials, the addition type silicone materials, Aquasil and Exaflex, had relatively greater accuracy and stability. The discrepancy of the alginate impression materials increased with storage time. The large loading of filler showed less discrepancy.[11]

Johnson GH et al determined whether irreversible hydrocolloid and polyether impressions could be disinfected by immersion without sacrificing accuracy and surface quality. Impressions were made of a master mandibular arch containing a crown preparation. Changes between the master and working casts were assessed. Irreversible hydrocolloids (Jeltrate; Palgaflex), a polyether (Impregum F), and an addition silicone (President) were used. Disinfectants were an iodophor (Biocide), a glyoxalglutaraldehyde (Impresept de), and a phenol glutaraldehyde (Sporicidin). The control was without disinfection. Casts were formed in Type IV gypsum. The roughness of working dies was also recorded and an analysis of variance was used for statistical evaluation. Results. Casts from disinfected irreversible hydrocolloid and elastomeric impressions maintained accuracy for anteroposterior and cross arch dimensions where differences from the master was less than 0.1%. Buccolingual and mesiodistal dimensions of working dies (disinfected and control) were 6 to 8 microm larger than the master for addition silicones and 11 to 16 pm for polyethers. The occlusogingival dimension of dies for control and disinfected polyether was 9 pm longer than the master compared with -3 microm for addition silicone. The range of mean surface roughness of working dies made from irreversible hydrocolloids was 1.4 to 1.7 microm and ranged from 0.5 to 0.7 microm for elastomeric impressions. Immersion disinfection of Jeltrate material with iodophor and Palgaflex material with glyoxalglutaraldehyde produced casts and dies as accurate as the control.[12]

CONCLUSION

From the above results, the authors concluded that in comparison to condensation silicone, additional silicone is a better impression material.

REFERENCES

1. Ciesco JN, Malone WF, Sandrik JL, Mazur B. Comparison of elastomeric impression materials used in fixed prosthodontics. J Prosthet Dent 1981; 45:89-94.
2. Endo T, Finger WJ. Dimensional accuracy of a new polyether impression material. Quintessence Int. 2006; 37(1):47–51.
3. Berg JC, Johnson GH, Lepe X, Adán-Plaza S. Temperature effects on the rheological properties of current polyether and polysiloxane impression materials during setting. J Prosthet Dent. 2003; 90(2):150–61.
4. Wadhwani CP, Johnson GH, Lepe X, Raigrodski AJ. Accuracy of newly formulated fast-setting elastomeric impression materials. J Prosthet Dent. 2005; 93(6):530–9.
5. Williams PT, Jackson DG, Bergman W. An evaluation of the time dependent dimensional stability of eleven elastomeric impression materials. J Prosthet Dent 1984; 52:120-5.
6. Anusavice KJ. Phillips science of dental materials. 11th ed. 1st Indian reprint. Saunders Co: 2003. p. 224.
7. Tjan AH, Whang SB, Tjan AH, Sarkissian R. Clinically oriented evaluation of the accuracy of commonly used impression material. J Prosthet Dent 1986; 56:4-8.
8. Thongthammachat S, Moore BK, Barco MT 2nd, Hovijitra S, Brown DT, Andres CJ. Dimensional accuracy of dental casts: Influence of tray material, impression material and time. J Prosthodont 2002; 11:98-108.
9. Richard B, Jack D, Elliott J, Russell M. The Dimensional Accuracy of 12 Impression Material and Die Stone Combinations. International Journal of Prosthodontics . Mar/Apr1991, Vol. 4 Issue 2, p169-174. 6p.
10. Ratnaweera PM1, Yoshida K, Miura H, Kohta A, Tsuchihira K. A clinical evaluation of the agar alginate combined impression: dimensional accuracy of dies by new master crown technique. J Med Dent Sci. 2003 Sep; 50(3):231-8.
11. Chen SY1, Liang WM, Chen FN. Factors affecting the accuracy of elastometric impression materials. J Dent. 2004 Nov; 32(8):603-9.
12. Johnson GH1, Chellis KD, Gordon GE, Lepe X. Dimensional stability and detail reproduction of irreversible hydrocolloid and elastomeric impressions disinfected by immersion. J Prosthet Dent. 1998 Apr; 79(4):446-53.

Source of support: Nil **Conflict of interest:** None declared