Effects of ultrasonic and sonic scaling on surfaces of tooth-colored restorative materials: An *in vitro* study

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Abstract

Objective: The effects of sonic and ultrasonic scalings (USSs) on the surface roughness of nanohybrid, flowable, and polyacid-modified resin composites and conventional glass ionomer cement were examined, and the effectiveness of repolishing on the scaled material surfaces was determined.

Materials and Methods: The surface roughness of each sample was measured three times before and after each scaling and after repolishing, and the data were analyzed using repeated measuresanalysis of variance, Tukey's multiple comparisons, and paired *t*-tests by a statistical program.

Results: Although sonic and USS both significantly increased the surface roughness of all the tooth-colored materials, USS roughened the surfaces of all the test materials more than SS did. Hence, USS may detrimentally affect tooth-colored restorative materials, especially conventional glass ionomers and compomers. Repolishing decreased the surface roughness of all the materials to near their baseline levels.

Conclusions: On the basis of these results, the repolishing of restoration surfaces is strongly recommended after dental scalings.

Key words: Repolishing, sonic scaling, tooth-colored dental materials, ultrasonic scaling

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Introduction

In the last decade, there has been great progress in the use of dental adhesives and resin composites and compomers, giving satisfactory results when used as tooth-colored restorative materials and combined with appropriate adhesive systems and properly implemented procedures.[1,2] The use of esthetic restorative materials has increased substantially owing to the increased esthetic demands of patients, developments in the adhesive dentistry, improvements in material formulation, and facilitation of adhesive procedures;[3-10] and the use of amalgams has also somewhat declined owing to the controversy of mercury toxicity.[11-15] In some countries, patients and professionals widely prefer tooth-colored adhesive materials in molar regions. Resin composites seem to be the most commonly used dental restorative materials for permanent molars, which survive the longest among adolescents.[2] In addition, various adhesive systems also show antibacterial properties.[10,16] The esthetic appearance and longevity of tooth-colored restorations depend closely on the quality of the finished surface integrity, and a smooth surface texture is of great importance for restorations.

The surface roughness of restorative materials can promote biofilm formation,[17,18] and a positive correlation was observed between surface roughness and vital *Streptococcus mutans* adhesion.[19] Smooth resin composite surfaces exhibit less bacterial adhesion and accumulation than rougher ones do,[20] and the smoothness of composite surfaces plays an important role in retarding biofilm adhesion and growth.[21] Thus, increased surface roughness facilitates the adhesion of bacterial populations, which promotes periodontal diseases, secondary caries, surface

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staining, and discomfort due to the retention of bacterial plaque.[22,23] Therefore, it is of great importance to be able to clean properly and treat tooth and restoration surfaces without traumatizing or damaging them.[24]

Ultrasonic scaling (USS) devices have recently become universally used in addition to conventional periodontal handheld instruments, and they effectively disrupt biofilms with minimal trauma to tooth structures.[25,26] Sonic and ultrasonic scalers have become the most widely used cleaning instruments among dental practitioners, because they make scaling more efficient and are easier to use than conventional handheld instruments. The effects of sonic and ultrasonic devices and laser treatments on hard and soft dental tissues have been investigated and well-documented in various studies.[27-35] Laser treatments, however, have shown similar or less effectiveness than piezoelectric-driven scalers in removing calculus and treating periodontal tissues.[28,30,33,34]

Nevertheless, limited information is available about the effects of sonic and USS on dental restorative materials, and a number of studies has shown that sonic and USS increased the surface roughness of tooth-colored restorations.[36-38] It was also concluded that polishing scaled surfaces might overcome the change in surface roughness.[38] Besides the type of adhesive system, margin locations also play an important role in the adaptation and integrity of composite restorations.[7] Considering that the proximal or gingival margins of restorations are located near the periodontal tissues, we can suppose that sonic and ultrasonic devices may damage the marginal integrity of cervical restorations, thus leading to the development of tooth sensitivity and adversely affecting the longevity and esthetic appearance of the restorations.

This *in vitro* study investigated the effects of sonic and USS on the surface roughness of different types of tooth-colored restorative materials recommended for use at the cervical and approximal regions. We hypothesized that sonic and USSs would alter restoration surfaces to varying degrees, depending on which materials were used, and that repolishing the scaled surfaces would reduce their surface roughness to clinically acceptable values.

Materials and Methods

The test materials were: A conventional glass ionomer cement (Ketac™ Molar Easymix, 3M™ ESPE™, St. Paul, MN, USA), a polyacid-modified resin composite (Compoglass® F, Vivadent, Schaan, Liechtenstein), a flowable resin composite (Tetric® Flow, Ivoclar Vivadent, Schaan, Liechtenstein), and a nanohybrid resin composite (Filtek™ Z550, 3M™ ESPE™, St. Paul, MN, USA). The types, manufacturers, lot numbers, and mean particle sizes of the tested restorative materials are listed in Table 1.

Specimen preparation

The test materials were overfilled into 8-mm-diameter, 2-mm-high cylindrical stainless-steel molds; the surfaces of which were then covered with polyester strips and pressed flat using a glass microscope slide to remove excess material and prevent the formation of an oxygen-inhibited surface layer. The specimens were polymerized according to the manufacturers' instructions by shining a curing light (Elipar, Freelight 2, 3M™ ESPE™, Seefeld, Oberbay, Germany) through the glass and the polyester strip onto the top surfaces. After the first light-curing, the specimens were removed from the molds, and the opposite sides of the specimens were irradiated in the same manner. The intensity of the light was checked using a curing-light meter (Hilux™ Curing-light Meter, Benlioglu Dental Inc., Ankara, Turkey) at the beginning of the experiment. Specimens were produced for each material group ($n = 20$), and once cured, were maintained at 100% relative humidity, at 37°C for 24 h. They were then successively polished with coarse then superfine abrasive discs (Sof-Lex™, 3M™ ESPE™, St. Paul, MN, USA) for 10 s each under cool water,[39] with the specimens rinsed under clean running water between each polishing step. The specimens were then ultrasonically cleaned (SOLTEC®, SONICA®, Milano, Italy) in distilled water for 10 min to remove polishing debris, and were then placed into 37°C distilled water for 24 h.

Surface roughness measurements

The prepared specimens of each material group were randomly divided using a computer program (Research Randomizer Version 3.0, http://www.randomizer.org/) into two subgroups ($n = 10$) for the different scaling devices. The average surface roughness (Ra, in μm) of the specimens was determined with a precalibrated surface roughness tester (Surtronic 25, Taylor Hobson™ Precision, England). Each specimen was measured at five indiscriminate areas, with the two outliner scores being excluded, and only the remaining three being included in the statistics. The average surface roughness of the specimens of each subgroup was measured and recorded to serve as the prescaling baseline controls.

A sonic scaler (SONICflex 2008, KaVo, Biberach, Germany) and an ultrasonic scaler (Cavitron® SPS™, DENTSPLY®, Konstanz, Germany) were used to simulate the scalings. These were similarly sized and oriented approximately perpendicular to the axis of the specimens, with their scaling tips angled at approximately 15° to the specimen surface. The specimens were scaled under copious amounts of flowing water and at a moderate power setting for 60 s, as previously described by Lai *et al.*, All the specimens were scaled by the same operator to prevent operator variation. The scaled specimens were rinsed under running water and were cleaned in an ultrasonic bath for 10 min. The mean surface roughness (Ra)

Table 1: Restorative materials used in this study

Group	Material	Mean particle size (μm)	Filler ratio wt%/vol%	LOT Number	Manufacturer
Resin composite	Z550	0.2-1.0	81.8/67.8	N284915	3M ESPE, St. Paul, MN, USA
Flowable resin composite	Tetric Flow	0.7	67/43	B30814	Ivoclar Vivadent, Schaan, Liechtenstein
Polyacid-modified resin	Compoglass F	1.0	79/55.9	R32643	Ivoclar Vivadent, Schaan, Liechtenstein
Glass ionomer	Ketac Molar Easymix	2.8	Data unavailable	481905	3M ESPE, St. Paul, MN, USA

Table 2: Mean surface roughness (Ra) values obtained for USS and SS

	Pre-SS	Post-SS	Repolished	Pre-USS	Post-USS	Repolished
Z550	0.096 (0.02)	0.164 (0.01)	0.106 (0.02)	0.098 (0.02)	0.188 (0.03)	0.108 (0.02)
Tetric Flow	0.078 (0.04)	0.142 (0.01)	0.09 (0.05)	0.081 (0.01)	0.172 (0.07)	0.091 (0.01)
Compoglass F	0.11 (0.04)	0.224 (0.01)	0.117 (0.04)	0.11 (0.01)	0.644 (0.25)	0.148 (0.04)
Ketac Molar	0.157 (0.01)	0.26 (0.01)	0.158 (0.01)	0.16 (0.11)	0.817 (0.27)	0.157 (0.03)

Standard deviation in parentheses. USS=Ultrasonic scaling; SS=Sonic scaling

values were then recorded. All the specimens were then repolished using the procedure described in the specimen preparation section and were ultrasonically cleaned. Finally, the surface roughness was measured for the third time and was recorded.

Statistical analysis

The means and standard deviations of the Ra values were determined. These data were then analyzed using repeated measures analysis of variance, Tukey's multiple comparisons, and paired *t*-tests by a statistical program (IBM® SPSS® Statistics 20, SPSS® Inc., Chicago, IL, USA). Differences at the $P < 0.05$ level were considered statistically significant.

Results

The mean surface roughness (Ra, in μm) and standard deviation measured before and after scaling, and after repolishing of the specimens, are presented in Table 2. For the baseline measurements, the surfaces of the Tetric® Flow and Z550 were smoother than those of the Compoglass® F and Ketac® Molar. Statistical analysis showed that both types of scaling had significantly increased the surface roughness of all the test materials. The surfaces of the scaled Ketac® Molar were the roughest, and those of the Tetric® Flow were the smoothest after both types of scaling.

Ultrasonic scaling produced rougher surfaces than SS for all the material groups, especially for the Ketac® Molar and Compoglass® F; the statistical results revealed significant differences ($P < 0.05$) between the roughness values for the sonically and ultrasonically scaled Ketac® Molar and Compoglass® F subgroups [Table 3]. Repolishing the surfaces of all the sonically and ultrasonically scaled specimens decreased the roughness values to near their baseline levels [Figure 1].

Table 3: Comparison of mean roughness (Ra) values for ultrasonically and sonically scaled specimens from each group

	USS	SS
Z550	0.188 (0.03)	0.164 (0.01)
Tetric Flow	0.172 (0.07)	0.142 (0.01)
Compoglass F	0.644 (0.25)	0.224 (0.01)*
Ketac Molar	0.817 (0.27)	0.26 (0.01)*

USS=Ultrasonic scaling; SS=Sonic scaling. *Statistically significant difference ($P<0.05$)

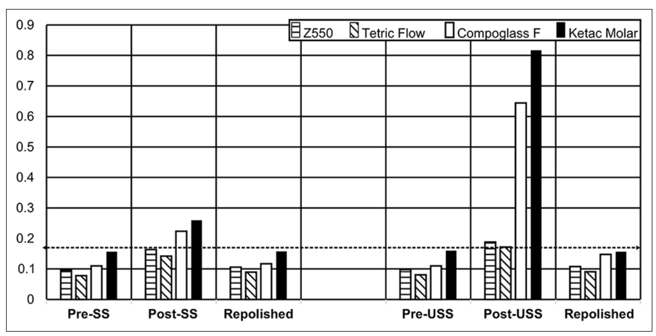

Figure 1: Average surface Ra values measured before and after scaling and after repolishing specimens

Discussion

Scaling is a basic procedure used in periodontal therapy, and piezoelectric-driven devices have become widely used to clean periodontal and cervical tooth areas.[27-35] However, these treatments might cause rough areas such as scratches, nicks, and chips on tooth-colored restorative materials.[36-38] Thus, sonic and ultrasonic scalers placed especially near cervical regions can easily damage restoration surfaces and margins, leading to dentinal sensitivity and subsequent dental and periodontal problems. Therefore, routine periodontal scaling procedures should be performed very carefully to ensure minimal damage to tooth and restoration surfaces. Proper instruments such as scaler tips and conditions like power settings should be carefully chosen in order to perform ideal treatments without damaging tooth and restoration surfaces.[25,35] Smooth resin composite surfaces exhibit less bacterial accumulation,[20] and so material surface alteration is another factor in determining bacterial adhesion.[40]

We intended to assess the surface alteration of tooth-colored restorative materials with different chemical properties when used with different scaling devices. The flowable and nanohybrid resin composites already showed smoother surfaces than the other materials at the beginning of the study, and all of the sonically and ultrasonically scaled materials showed statistically significant changes in surface roughness. The glass ionomer, Ketac® Molar, exhibited the roughest surfaces, while the flowable resin composite, Tetric® Flow, had the smoothest surfaces. These findings are consistent with those of Hossam *et al.*, Lai *et al.*, Mourouzis *et al.*, and Hossam *et al.*, who found ultrasonically scaled flowable composite material to have the smoothest surfaces among all of the nanofilled, Silorane™-based, and hybrid composites. Furthermore, fewer bacteria were found to grow on the flowable composite surface than on the other resin composite surfaces.[38]

In the present study, both scaling types significantly roughened the surfaces of all the test materials; however, USS more adversely affected the surface texture of all the materials than SS, especially in the Ketac® Molar and Compoglass® groups. Our findings are also similar to those of Lai *et al.*,[36] wherein different tooth-colored materials used for filling Class V cavities were investigated using both ultrasonic and SSs, and a significant increase in surface roughness was recorded for all the materials. Moreover, the flowable composite Tetric® Flow showed the least significant surface changes, and USS roughened the surfaces of the test materials more than SS, except in the case of Tetric® Flow. Mourouzis *et al.*,[37] examined the effects of SS on the surface roughness of some tooth-colored materials, finding that all of the sonically scaled test groups to exhibit significantly rougher surfaces, which were subsequently smoothed upon repolishing. The results of the present study also indicate that repolishing decreases the roughness values of all the materials to near their baseline levels; and thus, repolishing may be important for smoothing the dental- and periodontal-scaling-induced roughened surfaces of tooth-colored restorations. It should be noted here that the threshold surface roughness for bacterial retention is 0.2 μm, above which more plaque may accumulate.[41] The findings of the current study indicate that sonic and USSs may increase surface roughness above the 0.2 μm threshold for the compomer and glass ionomer materials tested, and that USS seems to more dramatically increase the surface roughness.

Polishing roughens the material surfaces the least, and so provides the least opportunity for plaque formation. It also seems to be very important to choose proper restorative materials for filling cavities in critical dental areas where traumatic periodontal treatments like scaling could be performed from time to time. Within the limitations of the current study, the flowable composite, Tetric® Flow, appears to be the most suitable for such a purpose. This resin composite is a low-flowable material that exhibits a decreased filler loading (67% filler by weight, 43% by volume) and a high radiopacity, which have previously been recommended for many clinical uses.[42,43]

Conclusion

All the sonically and ultrasonically scaled tooth-colored materials tested in this study were found to have significantly rougher surfaces; and the flowable composite, Tetric® Flow, showed smoother surfaces than the Z550, Compoglass® F, and Ketac® Molar. USS produced rougher surfaces than SS and, therefore, much more adversely affected the surfaces of glass ionomer and polyacid-modified resin composites. Repolishing reduced the surface roughness of all the tooth-colored materials to near their baseline levels, and thus, repolishing scaled restorations is strongly recommended in order to reproduce clinically acceptable restoration surfaces. Within the limitations of the present study, the flowable composite seemed to be the most suitable restorative material for risky tooth areas, at least when used with proper finishing and polishing systems.

References

1. Stojanac IL, Premovic MT, Ramic BD, Drobac MR, Stojsin IM, Petrovic LM. Noncarious cervical lesions restored with three different tooth-colored materials: Two-year results. Oper Dent 2013;38:12-20.
2. Vähänikkilä H, Käkilehto T, Pihlaja J, Päkkilä J, Tjäderhane L, Suni J, *et al.* A data-based study on survival of permanent molar restorations in adolescents. Acta Odontol Scand 2014;72:380-5.
3. Garcia-Godoy F, Krämer N, Feilzer AJ, Frankenberger R. Long-term degradation of enamel and dentin bonds: 6-year results *in vitro* vs. *in vivo*. Dent Mater 2010;26:1113-8.
4. Bortolotto T, Doudou W, Kunzelmann KH, Krejci I. The competition between enamel and dentin adhesion within a cavity: An *in vitro* evaluation of class V restorations. Clin Oral Investig 2012;16:1125-35.
5. Chee B, Rickman LJ, Satterthwaite JD. Adhesives for the restoration of non-carious cervical lesions: A systematic review. J Dent 2012;40:443-52.
6. Alleman DS, Deliperi S. Adhesive dentistry: 2013 and into the future. Compend Contin Educ Dent 2013;34:698-9.
7. Casselli DS, Faria-e-Silva AL, Casselli H, Martins LR. Marginal adaptation of class V composite restorations submitted to thermal and mechanical cycling. J Appl Oral Sci 2013;21:68-73.
8. Catelan A, Giorgi MC, Soares GP, Lima DA, Marchi GM, Aguiar FH. Effect of different monomer-based composites and acid etching pre-treatment of enamel on the microleakage using self-etch adhesives systems. Acta Odontol Scand 2014.
9. Delaviz Y, Finer Y, Santerre JP. Biodegradation of resin composites and adhesives by oral bacteria and saliva: A rationale for new material designs that consider the clinical environment and treatment challenges. Dent Mater 2014;30:16-32.
10. Nair M, Paul J, Kumar S, Chakravarthy Y, Krishna V, Shivaprasad. Comparative evaluation of the bonding efficacy of sixth and seventh generation bonding agents: An *in-vitro* study. J Conserv Dent 2014;17:27-30.
11. Roberts HW, Charlton DG. The release of mercury from amalgam restorations and its health effects: A review. Oper Dent 2009;34:605-14.

12. Richardson GM, Wilson R, Allard D, Purtill C, Douma S, Gravière J. Mercury exposure and risks from dental amalgam in the US population, post-2000. Sci Total Environ 2011;409:4257-68.
13. Bamise CT, Oginni AO, Adedigba MA, Olagundoye OO. Perception of patients with amalgam fillings about toxicity of mercury in dental amalgam. J Contemp Dent Pract 2012;13:289-93.
14. Rathore M, Singh A, Pant VA. The dental amalgam toxicity fear: A myth or actuality. Toxicol Int 2012;19:81-8.
15. Homme KG, Kern JK, Haley BE, Geier DA, King PG, Sykes LK, *et al.* New science challenges old notion that mercury dental amalgam is safe. Biometals 2014;27:19-24.
16. Esteves CM, Ota-Tsuzuki C, Reis AF, Rodrigues JA. Antibacterial activity of various self-etching adhesive systems against oral streptococci. Oper Dent 2010;35:448-53.
17. Crawford RJ, Webb HK, Truong VK, Hasan J, Ivanova EP. Surface topographical factors influencing bacterial attachment. Adv Colloid Interface Sci 2012;179-182:142-9.
18. Wessel SW, Chen Y, Maitra A, van den Heuvel ER, Slomp AM, Busscher HJ, *et al.* Adhesion forces and composition of planktonic and adhering oral microbiomes. J Dent Res 2014;93:84-8.
19. Aykent F, Yondem I, Ozyesil AG, Gunal SK, Avunduk MC, Ozkan S. Effect of different finishing techniques for restorative materials on surface roughness and bacterial adhesion. J Prosthet Dent 2010;103:221-7.
20. Ikeda I, Otsuki M, Sadr A, Nomura T, Kishikawa R, Tagami J. Effect of filler content of flowable composites on resin-cavity interface. Dent Mater J 2009;28:679-85.
21. Ono M, Nikaido T, Ikeda M, Imai S, Hanada N, Tagami J, *et al.* Surface properties of resin composite materials relative to biofilm formation. Dent Mater J 2007;26:613-22.
22. McConnell MD, Liu Y, Nowak AP, Pilch S, Masters JG, Composto RJ. Bacterial plaque retention on oral hard materials: Effect of surface roughness, surface composition, and physisorbed polycarboxylate. J Biomed Mater Res A 2010;92:1518-27.
23. Kimyai S, Lotfipour F, Pourabbas R, Sadr A, Nikazar S, Milani M. Effect of two prophylaxis methods on adherence of *Streptococcus mutans* to microfilled composite resin and giomer surfaces. Med Oral Patol Oral Cir Bucal 2011;16:e561-7.
24. Heintze SD, Forjanic M, Ohmiti K, Rousson V. Surface deterioration of dental materials after simulated toothbrushing in relation to brushing time and load. Dent Mater 2010;26:306-19.
25. Apatzidou DA. Modern approaches to non-surgical biofilm management. Front Oral Biol 2012;15:99-116.
26. Drisko CL, Cochran DL, Blieden T, Bouwsma OJ, Cohen RE, Damoulis P, *et al.* Position paper: Sonic and ultrasonic scalers in periodontics. Research, science and therapy committee of the American academy of periodontology. J Periodontol 2000;71:1792-801.
27. Kawashima H, Sato S, Kishida M, Ito K. A comparison of root surface instrumentation using two piezoelectric ultrasonic scalers and a hand scaler *in vivo*. J Periodontal Res 2007;42:90-5.
28. Ota-Tsuzuki C, Martins FL, Giorgetti AP, de Freitas PM, Duarte PM. *In vitro* adhesion of *Streptococcus sanguinis* to dentine root surface after treatment with Er:YAG laser, ultrasonic system, or manual curette. Photomed Laser Surg 2009;27:735-41.
29. Dahiya P, Kamal R, Gupta R, Pandit N. Comparative evaluation of hand and power-driven instruments on root surface characteristics: A scanning electron microscopy study. Contemp Clin Dent 2011;2:79-83.
30. Tsurumaki Jdo N, Souto BH, Oliveira GJ, Sampaio JE, Marcantonio Júnior E, Marcantonio RA. Effect of instrumentation using curettes, piezoelectric ultrasonic scaler and Er, Cr:YSGG laser on the morphology and adhesion of blood components on root surfaces: A SEM study. Braz Dent J 2011;22:185-92.
31. Dahiya P, Kamal R. Ultra-morphology of root surface subsequent to periodontal instrumentation: A scanning electron microscope study. J Indian Soc Periodontol 2012;16:96-100.
32. Marda P, Prakash S, Devaraj CG, Vastardis S. A comparison of root surface instrumentation using manual, ultrasonic and rotary instruments: An *in vitro* study using scanning electron microscopy. Indian J Dent Res 2012;23:164-70.
33. Amid R, Kadkhodazadeh M, Fekrazad R, Hajizadeh F, Ghafoori A. Comparison of the effect of hand instruments, an ultrasonic scaler, and an erbium-doped yttrium aluminium garnet laser on root surface roughness of teeth with periodontitis: A profilometer study. J Periodontal Implant Sci 2013;43:101-5.
34. Mishra MK, Prakash S. A comparative scanning electron microscopy study between hand instrument, ultrasonic scaling and erbium doped: Yttirum aluminum garnet laser on root surface: A morphological and thermal analysis. Contemp Clin Dent 2013;4:198-205.
35. Kamath DG, Umesh Nayak S. Detection, removal and prevention of calculus: Literature Review. Saudi Dent J 2014;26:7-13.
36. Lai YL, Lin YC, Chang CS, Lee SY. Effects of sonic and ultrasonic scaling on the surface roughness of tooth-colored restorative materials for cervical lesions. Oper Dent 2007;32:273-8.
37. Mourouzis P, Koulaouzidou EA, Vassiliadis L, Helvatjoglu-Antoniades M. Effects of sonic scaling on the surface roughness of restorative materials. J Oral Sci 2009;51:607-14.
38. Hossam AE, Rafi AT, Ahmed AS, Sumanth PC. Surface topography of composite restorative materials following ultrasonic scaling and its impact on bacterial plaque accumulation. An *in-vitro* SEM study. J Int Oral Health 2013;5:13-9.
39. Nagem Filho H, D'Azevedo MT, Nagem HD, Marsola FP. Surface roughness of composite resins after finishing and polishing. Braz Dent J 2003;14:37-41.
40. Poggio C, Arciola CR, Rosti F, Scribante A, Saino E, Visai L. Adhesion of *Streptococcus mutans* to different restorative materials. Int J Artif Organs 2009;32:671-7.
41. Bollen CM, Lambrechts P, Quirynen M. Comparison of surface roughness of oral hard materials to the threshold surface roughness for bacterial plaque retention: A review of the literature. Dent Mater 1997;13:258-69.
42. Gallo JR, Burgess JO, Ripps AH, Walker RS, Maltezos MB, Mercante DE, *et al.* Three-year clinical evaluation of two flowable composites. Quintessence Int 2010;41:497-503.
43. Attar N, Tam LE, McComb D. Flow, strength, stiffness and radiopacity of flowable resin composites. J Can Dent Assoc 2003;69:516-21.

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