DENTSPLY
CAULK

SureFil® SDR™ flow

Compilation of Studies

Table of Contents

Table of Contents

Table of Contents

Table of Contents

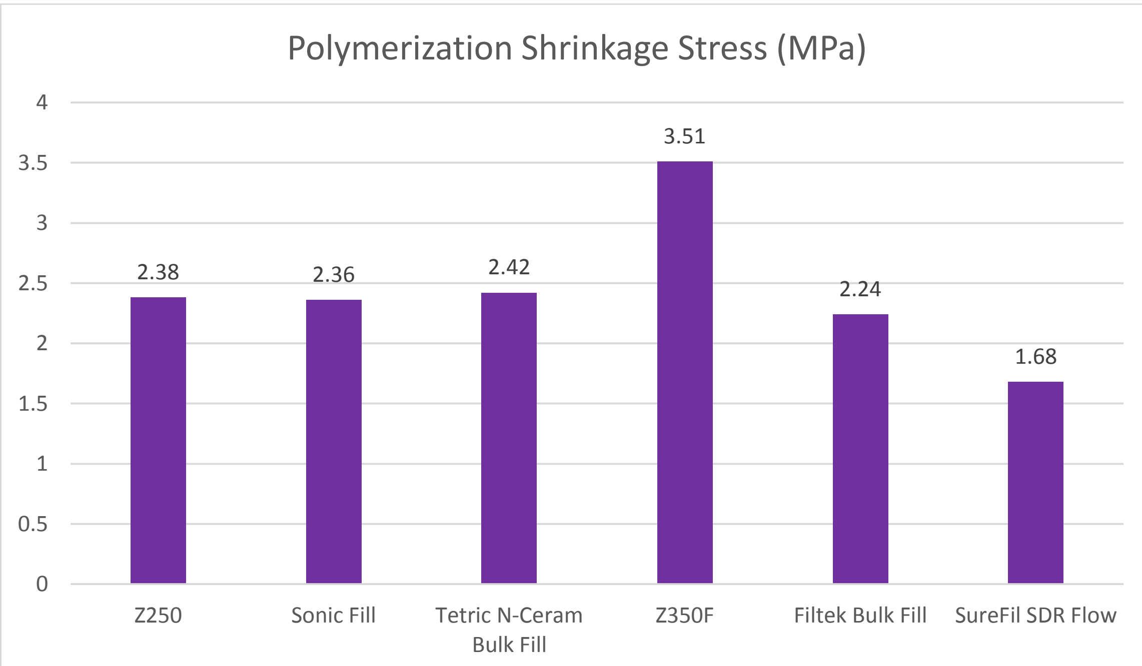
A. STRESS REDUCTION

Polymerization shrinkage, modulus, and shrinkage stress related to tooth-restoration interfacial debonding in bulk-fill composites.

Kim RJ, Kim YJ, Choi NS, Lee IB. J Dent. 2015 Apr; 43(4):430-9.[1]

OBJECTIVE: The aim of the present study was to measure the polymerization shrinkage, modulus, and shrinkage stress of bulk-fill and conventional composites

RESULTS:



CONCLUSION: Filtek Bulk Fill and SureFil SDR demonstrated better results in terms of polymerization shrinkage stress and tooth-composite interfacial debonding than did the low-viscosity conventional composite (Z350F). However, they are not perfect substitutes to conventional high-viscosity composites due to their relatively lower modulus and higher shrinkage.

Cuspal Flexure and Extent of Cure of a Bulk-fill Flowable Base Composite.

Francis A, Braxton A, Ahmad W, Tantbirojn D, Simon J, Versluis A. Oper Dent. March 2015 [2]

OBJECTIVE: To investigate Surefil SDR Flow in terms of cuspal flexure and cure when used in incremental or bulk techniques. Incrementally placed conventional composite Esthet-X HD was used as control.

RESULTS: Surefil SDR Flow, either incrementally or bulk filled, demonstrated significantly less cuspal flexure than Esthet-X HD. The hardness of Surefil SDR Flow did not change throughout the depth for both incrementally and bulk filled restorations; the hardness of Esthet-X HD was statistically significantly lower at the bottom of each increment than at the top.

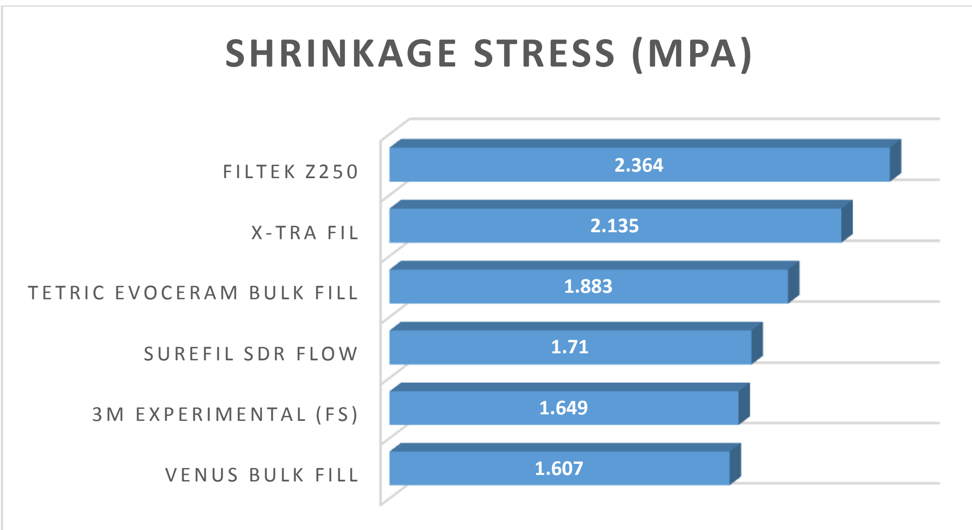
CONCLUSION: SureFil SDR Flow bulk-fill composite caused less cuspal flexure than the incrementally placed conventional composite. It cured all the way through (4 mm), whereas the conventional composite had lower cure at the bottom of each increment.

Polymerization Shrinkage and Depth of Cure of Bulk-Fill Resin Composites and Highly Filled Flowable Resin

Jang JH, Park SH, Hwang IN. Oper Dent. 2015 Mar-Apr;40(2):172-80[3]

OBJECTIVE: The aim of this study was to evaluate the polymerization shrinkage stress and depth of cure of recently introduced resin composites for posterior use: G-aenial Universal Flo [GUF], Surefil SDR Flow [SDR], Venus Bulk fill [VBF], and Tetric N-Ceram Bulk fill [TBF] with two conventional composites (Tetric Flow [TF], Filtek Supreme Ultra [FS]).

RESULTS: Polymerization shrinkage stress of the six composite groups: GUF > TF and VBF > SDR > FS and TBF ($p<0.05$). The mean bottom surface HV of SDR and VBF exceeded 80% of the top surface HV (HV-80%). Bulk-fill flowables (SDR and VBF) were properly cured in 4-mm bulk, but they shrank more than the conventional nonflowable composite.



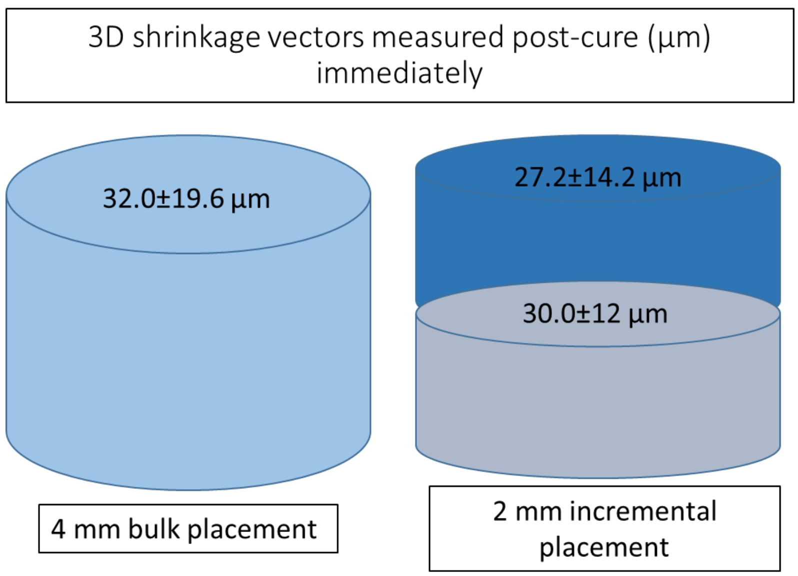
CONCLUSION: SureFil SDR Flow and Venus Bulk Fill induce less polymerization shrinkage stress as compared to Tetric EvoCeram Bulk Fill, X-tra Fil and Z250.

Shrinkage vectors in bulk versus incrementally applied SDR bulkfill composite.

Kaisarly D, El Gezawi M, Roesch P, Hickel R, Kunzelmann K. IADR 2015, Abstract#0383[4]

OBJECTIVE: The aim of this study was to investigate shrinkage vectors in SureFil SDR Flow at 4-mm bulk placement and 2-mm incremental placement.

RESULTS:



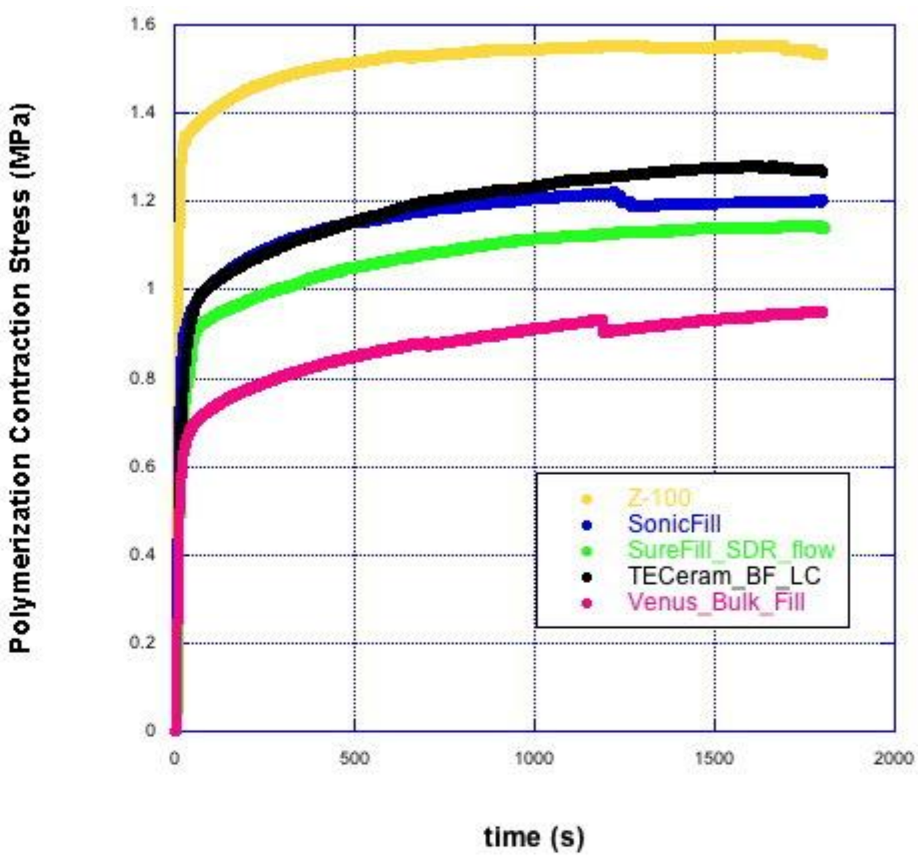
CONCLUSION: Bulk application of SDR Flow resulted in larger shrinkage vectors than when applied incrementally as well as greater upward movement. It can be concluded that the method of application did influence the magnitude and direction of shrinkage vectors obtained in SDR.

Polymerization Shrinkage and Contraction Stress of Bulk-fill Composites

Shin D, Suh B. IADR 2015, Abstract # 0384[5]

OBJECTIVE: The aim of this study was to compare polymerization shrinkage and contraction stress of bulk-fill composite materials using a rheometer (AR2000ex, TA Instruments) and a newly designed stress measuring device with simulated class I cavity.

RESULTS:



CONCLUSION: SureFil SDR Flow and Venus bulk fill showed lowest contraction stress while Z-100 produced highest contraction stress after 30 minutes. Same trend was observed in contraction stress rates during initial 60 seconds.

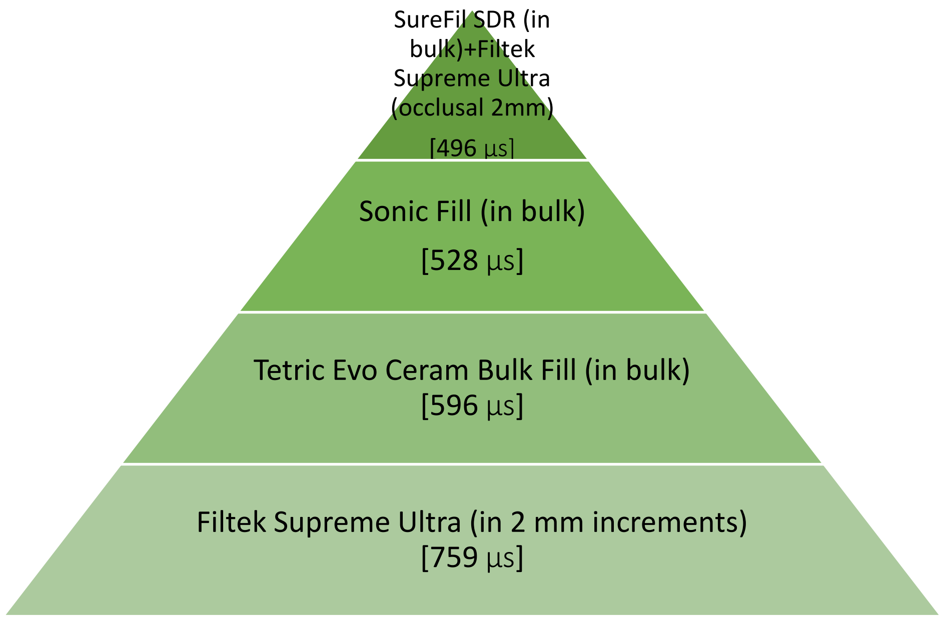
Effect of composite type and placement technique on shrinkage stress

Olafsson VG, Ritter A, Swift EJ, Boushell LW, Ko C, Donovan TE. IADR 2015, Abstract #2198[6]

OBJECTIVE: Compare the polymerization shrinkage stress exerted on tooth structure by bulk-fill and conventional composite resins

RESULTS:

Polymerisation shrinkage stress for bulk-filled composites



CONCLUSION: SureFil SDR Flow placed in bulk and covered with 2mm occlusal composite layer (Filtek Supreme Ultra) provided the least shrinkage strain. Bulk-filling with conventional composite resins is unpredictable and contraindicated.

Polymerization shrinkage stress and biaxial flexural strength of bulk-fill composites

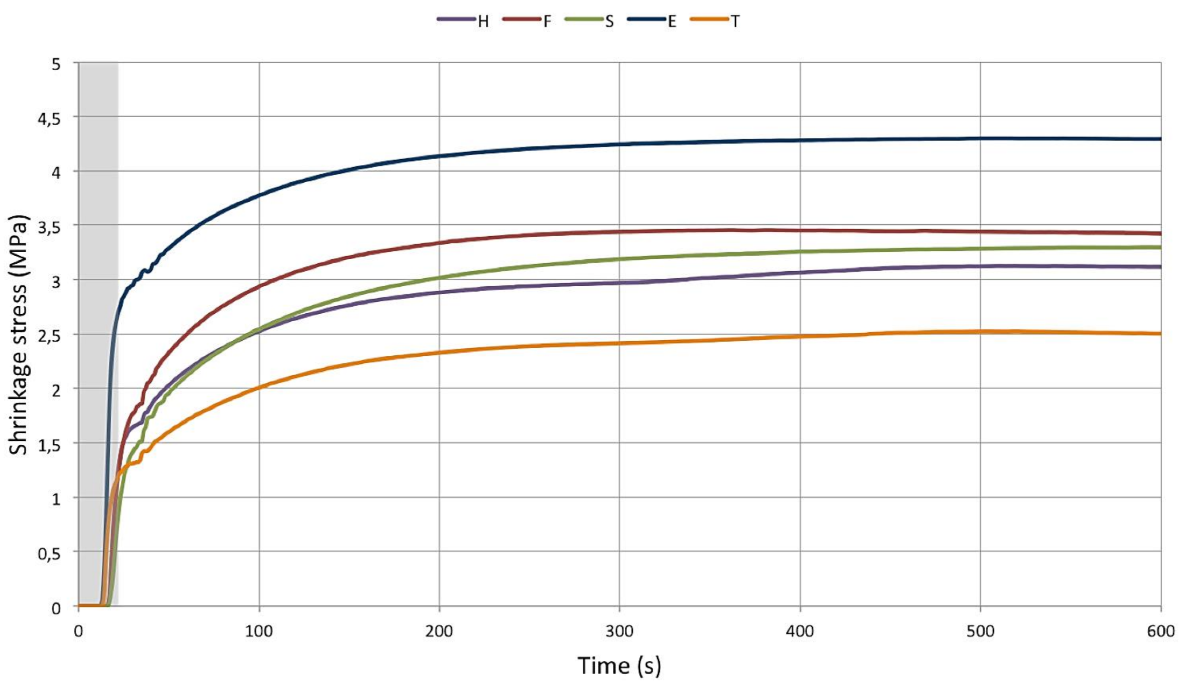
Fronza BM, Ayres AA, Pacheco RR, Ambrosano GM, Braga R, Rueggeberg FA, Giannini M.

IADR 2015, Abstract #2197[7]

OBJECTIVE: The objectives of the study were to investigate the polymerization shrinkage stress and influence of depth on biaxial flexural strength and modulus of bulk-fill composites

RESULTS:

H→ Herculite Classic, F→ Filtek Bulk-fill, S→ Surefil SDR Flow, E→ EverX Posterior
T→ Tetric EvoCeram Bulk-fill



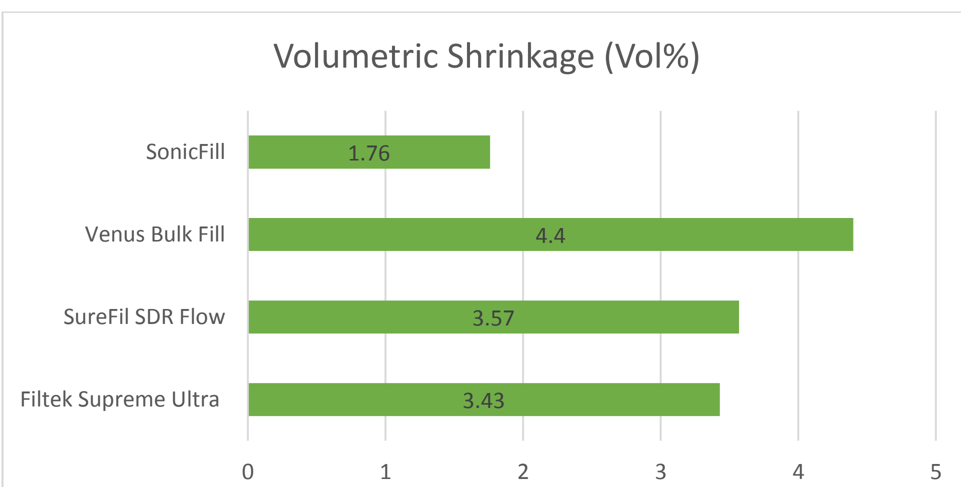
CONCLUSION: Most of bulk-fill composites have similar polymerization shrinkage to the control group. The depth does not affect the flexural strength of SureFil SDR flow and other bulk-fill materials, which suggests appropriate polymerization in the full extent of these materials.

Polymerization shrinkage and depth of cure of bulk fill flowable composite resins.

Garcia D, Yaman P, Dennison J, Neiva G. Oper Dent 2014; 39(4):441-8 [8]
AADR 2012, Abstract#860 [9]

OBJECTIVE: To evaluate polymerization shrinkage and depth of cure of SureFil SDR flow (SSF/Dentsply) and Venus Bulk Fill (VBF/Heraeus Kulzer), Filtek Supreme Ultra Flowable (FSUF/3M ESPE) (control), and SonicFill (SF/Kerr), comparing the scraping method to the Knoop hardness test.

RESULTS: Values for the scraping method for depth of cure were significantly greater for SSF and VBF (>5.0 mm), followed by SF (3.46 ± 0.16 mm) and FSU (2.98 ± 0.22 mm). Knoop top hardness values (KHN) were: VBF 21.55 ± 2.39, FSUF 44.62 ± 1.93, SSF 29.17 ± 0.76, and SF 72.56 ± 2.4 at 2 mm and were not significantly different at 3-, 4-, and 5-mm thick within each material. Ratios for bottom/top values (depth of cure) for 2, 3, 4, and 5 mm were: VBF 0.80 ± 0.1, 0.78 ± 0.03, 0.67 ± 0.10, and 0.59 ± 0.07, respectively; SSF 0.74 ± 0.08, 0.72 ± 0.08, 0.69 ± 0.18, and 0.62 ± 0.08, respectively; SF 0.82 ± 0.05, 0.68 ± 0.05, 0.47 ± 0.04, and 0.21 ± 0.02, respectively; and FSUF 0.56 ± 0.08 at 2 mm and 0.40 ± 0.08 at 3 mm.



CONCLUSION: SureFil SDR Flow and Filtek Supreme Ultra show comparable polymerization shrinkage, which is significantly lower than Venus Bulk Fill.

Polymerization Shrinkage Stress Kinetics and Related Properties of Bulk-fill Resin Composites.

El-Damanhoury H, Platt J. Oper Dent 2013 [10]

IADR 2013, Abstract#2439 [11]

OBJECTIVE: The present study assessed the polymerization shrinkage stress kinetics of five low-shrinkage light-cured bulk-fill resin composites: Surefil SDR flow (SF, Dentsply), Tetric EvoCeram Bulkfil (TE, Ivoclar Vivadent), Venus Bulk Fill (VB, Heraeus Kulzer), x-tra fil (XF, Voco), and experimental bulk fill (FB, 3M ESPE). Filtek Z250 (FZ, 3M ESPE) was used as a control.

RESULTS: Results of shrinkage stress, Rmax, and tmax of all bulk-fill materials were significantly lower ($p<0.05$) than those of the control except for XF. All tested bulk-fill materials were able to achieve acceptable curing efficiency (≥80% bottom/top percentage) at 4-mm depth.

CONLCUSION: Significant reduction in polymerization shrinkage stress while maintaining comparable curing efficiency at 4 mm is achievable for some bulk-fill composites, including SureFil SDR Flow, which supports their potential use in posterior clinical situations.

Comparative properties of low-shrinkage composite resins.

Burgess J1, Cakir D. Compend Contin Educ Dent. 2010 May;31 Spec No 2:10-5. [12]

OBJECTIVE:

To measure the polymerization shrinkage, wear, surface roughness, gloss, color stability, and stain resistance of N'Durance, SureFil SDR, and Filtek LS, and compare those values to currently used clinically successful composites.

RESULTS:

Filtek LS had the lowest polymerization shrinkage values. Gloss and roughness average values were similar for all materials measured. Color stability measurements for all composite resins in water and UV light were less than 3. All composite resins had similar values when placed in the staining solution.

CONCLUSION:

Low-shrinkage composite resin restorative materials such as SureFil SDR Flow have mechanical and physical properties similar to clinically successful composite resins.

A Novel Three-dimensional Micro-computed Tomography Evaluation of Resin Composite Shrinkage

R. Hirata, E. Clozza, M. Giannini, M.N. Janal, N. Tovar, and P.G. Coelho. AADR 2014, Abstract#177 [13]

OBJECTIVE:

The aims of this study were to (1) introduce a novel three-dimensional (3D) method using micro-computed tomography (µCT) imaging to visualize and quantify the polymerization volumetric shrinkage of one regular composite (Vitalescence, Ultradent) and one bulk fill composite(SureFil SDR Flow) and (2) evaluate the effect bonding agent application has on polymerization shrinkage pattern within the preparation walls (Peak Universal Bond/Ultradent and XP Bond/Dentsply Caulk)

RESULT:

The micro-CT revealed that all restorations underwent volumetric polymerization shrinkage, with significant differences between them, regardless of adhesive application. SureFil SDR Flow showed lower change in volume when compared to Vitalescence. The use of dental adhesive decreased the volumetric shrinkage.

CONCLUSION:

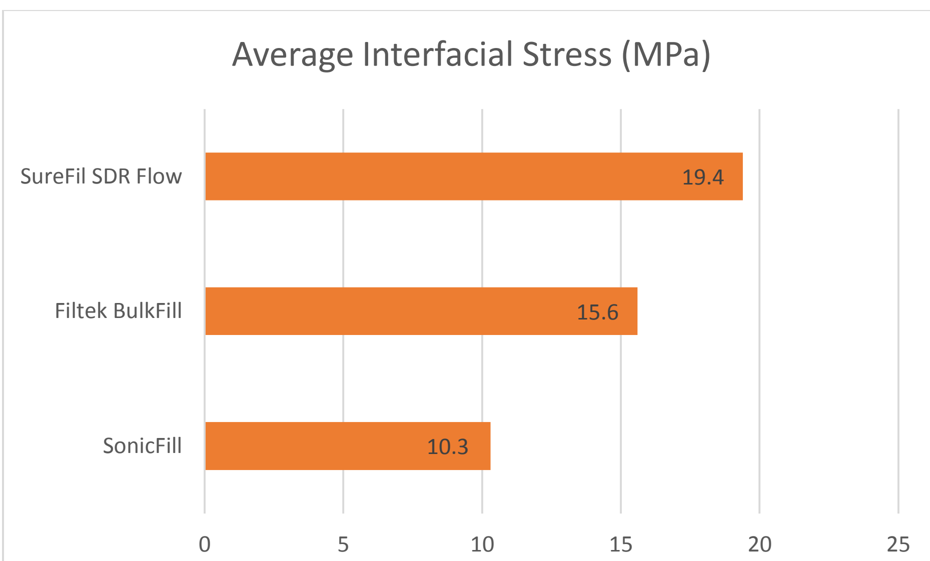
This experiment confirms that dental adhesive application at the interface restoration–tooth is a critical factor to counteract the volumetric loss and unwanted gaps following light-curing.

Measuring Shrinkage Stress in Model Restorations using Digital Image Correlation

P. Thakur, Y. Chen, and A.S. Fok. IADR 2014, Abstract#211 [14]

OBJECTIVE: To determine the interfacial stress for three bulk-fill composites, Filtek BulkFill (3M ESPE), SureFil SDR (Dentsply) or SonicFill (Kerr), placed in model cavities using the thick-walled cylinder theory and displacements obtained from Digital Image Correlation (DIC).

RESULT: SonicFill gave the lowest interfacial radial displacement (0.008±0.003mm), followed by BulkFill (0.013±0.004mm) and SureFil (0.016±0.004mm). The noise level in the displacement was ±0.001mm. The average interfacial stress was 10.3 MPa for SonicFill, 15.6 MPa for Bulk Fill and 19.4 MPa for SureFil.



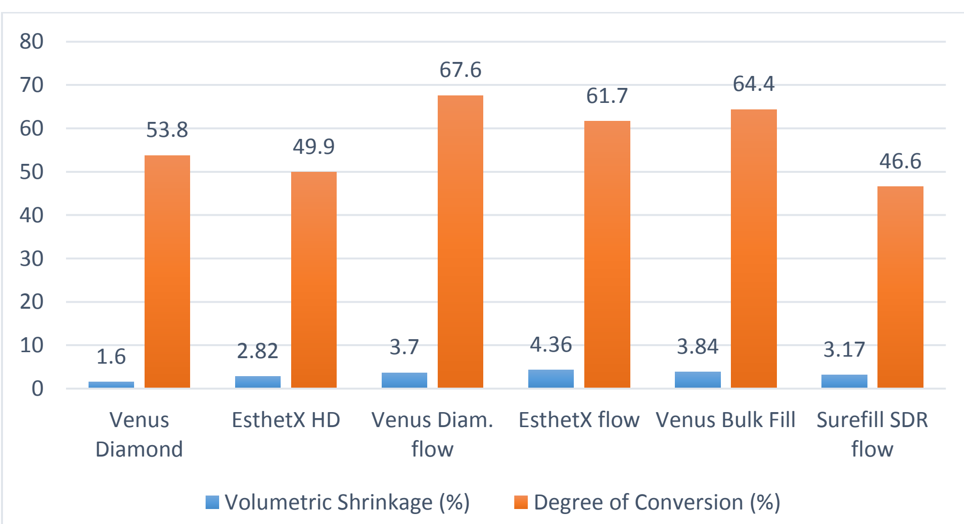
CONCLUSION: DIC was used successfully to measure the shrinkage stress of flowable composites placed in model Class-I cavities.

Volumetric Shrinkage and Conversion of Low-Stress Flowable Dental Composites

C. Francci, L.C. Yamasaki and C. Pfeifer. IADR 2012, Abstract#1057 [15]

OBJECTIVE: This study analyzes bulk filled flowable composites compared to their conventional analogs in terms of their volumetric shrinkage(VS) and degree of conversion (DC), important determinants to final mechanical properties and stress development. Six composites were selected: Venus Diamond (VD) and EsthetXHD (EHD) as the conventional controls, Venus Diamond flow (VDF) and EsthetX flow (ESF) as conventional flowable composites, and Venus Bulk Fill (VBF) and Surefil SDR flow (SDR) as low-stress flowable composites.

RESULTS: Due to their lower filler content, flowable composites presented higher VS, in general accompanied by higher degree of conversion. VD presented the lowest VS due to its higher molecular weight compared to conventional counterparts.



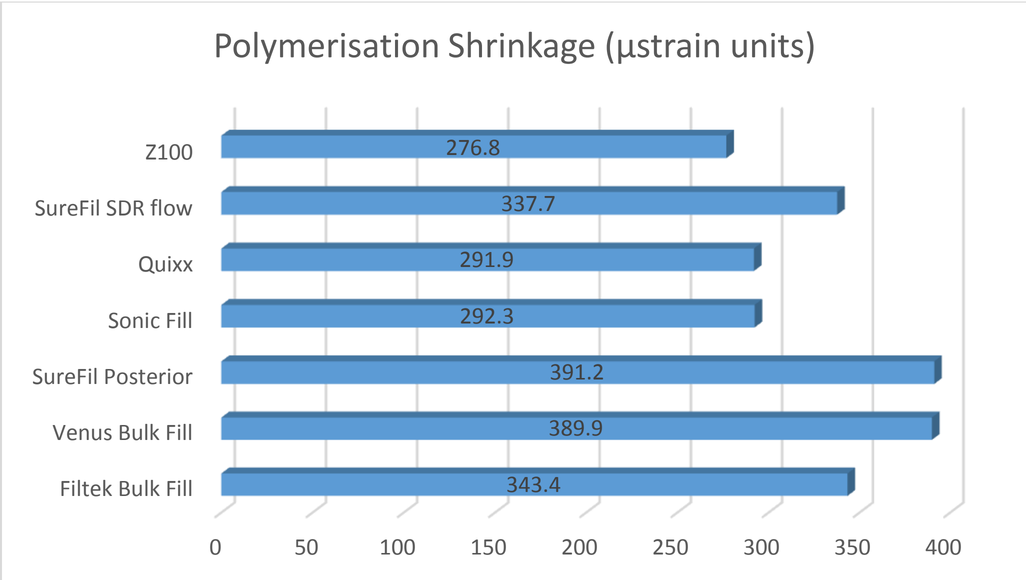
CONCLUSION: Within the "low-stress" materials, SureFil SDR Flow presented the lowest volumetric shrinkage but also the lowest degree of conversion. Bulk-filled flowable restorations may be a viable, less time consuming restorative alternative.

Polymerization Shrinkage Strain Produced By Composite Resins

S.A. Godbole, P. Beck, D. Cakir-Ustun, L.C. Ramp, J. Lemons, and J. Burgess. IADR 2013, Abstract#1115 [16]

OBJECTIVE: To measure and compare polymerization shrinkage strain of commercially available composite resin materials.

RESULTS:



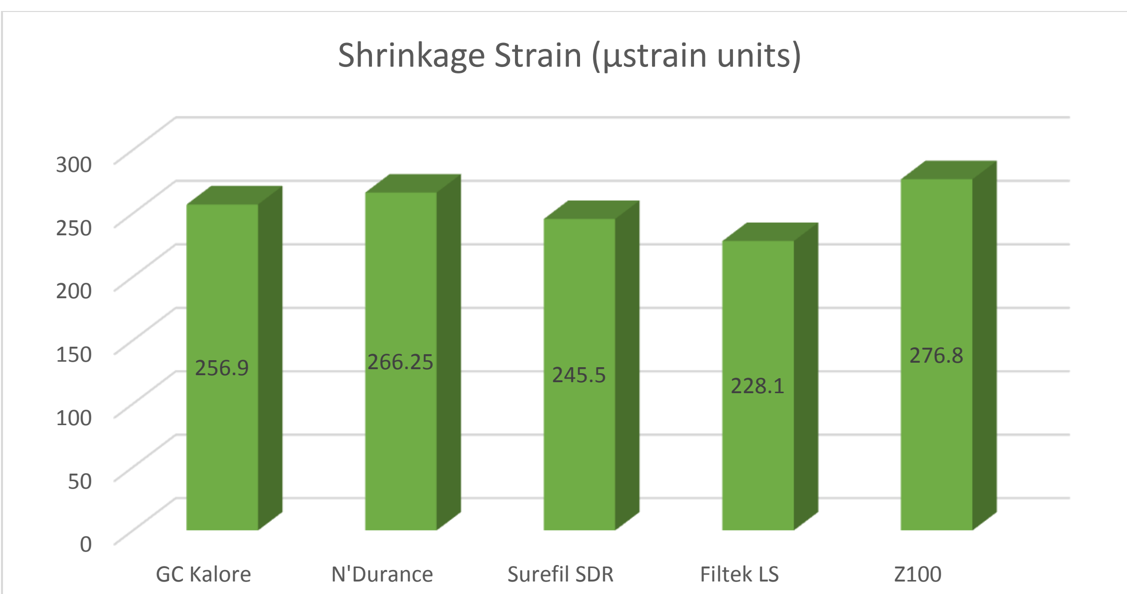
CONCLUSION: Residual shrinkage strain was significantly lower for Filtek Bulk Fill and SureFil SDR flow ($p<.05$). This reduces post-operative sensitivity, micro-leakage and secondary caries seen in composites.

Polymerization Shrinkage Strain Produced by Low-Shrinkage Composite Resins

G. Natarajarathinam, I.S. Mugisa, C. Michelson, P. Beck, M. Litaker, D. Cakir, J. Lemons, and J. Burgess. IADR 2011, Abstract#603 [17]

OBJECTIVE: To measure and compare polymerization shrinkage strain of four low-shrinkage and one high shrinkage composite resin (Z100 3M-ESPE).

RESULTS:



CONCLUSION: Within the limits of this study, there was no statistically significant difference between residual strain of Filtek LS and SureFil SDR Flow, which was lower than GC Kalore, N'Durance. Z100 had significantly higher strain than all other composite resins tested.

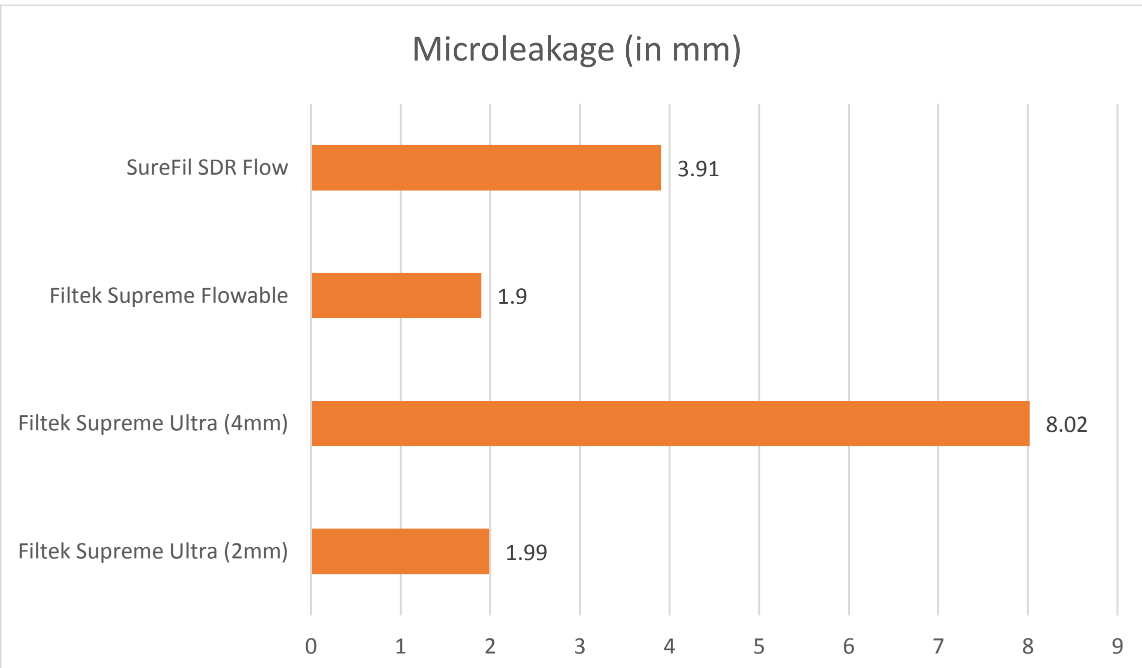
B. ADAPTATION AND MICROLEAKAGE

Comparison of microleakage between bulk-fill flowable and nanofilled resin-based composites

AlSagob E, Bardwell D, Khayat S, Stark PC, Ali A. IADR 2015, Abstract #0648[18]

OBJECTIVE: The objective of this study was to compare the marginal leakage (silver nitrate uptake) of Nanohybrid Resin-Based Composite (RBC) and two Bulk-fill Flowable RBCs.

RESULTS:



CONCLUSION: The microleakage of the bulk-fill composites Filtek Supreme Flowable and SureFil SDR Flow are comparable to conventional composite Filtek Supreme (2mm increment).

Marginal quality of five different bulk-fill composites in deep cavities.

Taschner M, Lindner R, Petschelt A, Zorzin J. IADR 2015, Abstract #0653[19]

OBJECTIVE: Aim of this in-vitro study was to analyse the effect of thermo-mechanical loading on the marginal integrity of five different bulk-fill composites in 6 mm deep cavities.

RESULTS: Before thermomechanical loading, SureFil SDR Flow, Tetric EvoCeram Bulk Fill and X-tra fil performed well with nearly 100% gap free margins in enamel, whereas in dentin only Tetric EvoCeram Bulk Fill achieved an acceptable amount (86%) of gap free margins.

After thermomechanical loading all materials show poor marginal integrity (lower than 70%) in dentin.

CONCLUSION: Within the limits of this study, bulk fill composites can't be recommended for clinical use in 6 mm deep cavities.

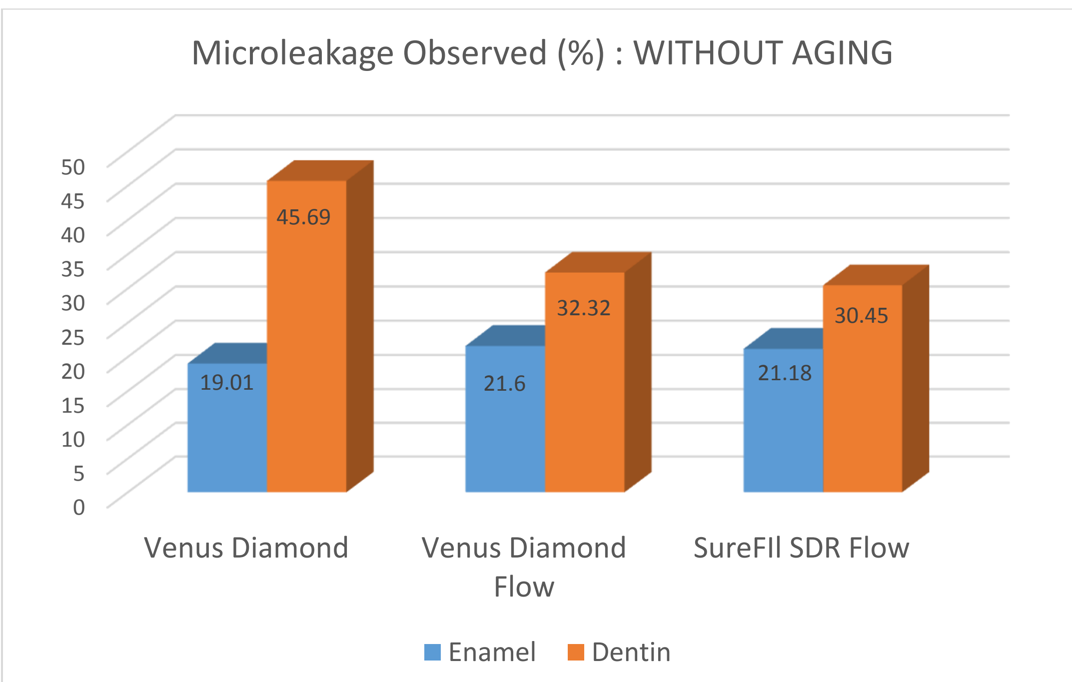
Microleakage at enamel and dentin margins with a bulk fill flowable resin

Scotti N, Comba A, Gambino A, Paolino DS, Alovisi M, Pasqualini D, Berutti E. Eur J Dent 2014;8(1):1-8.[20]

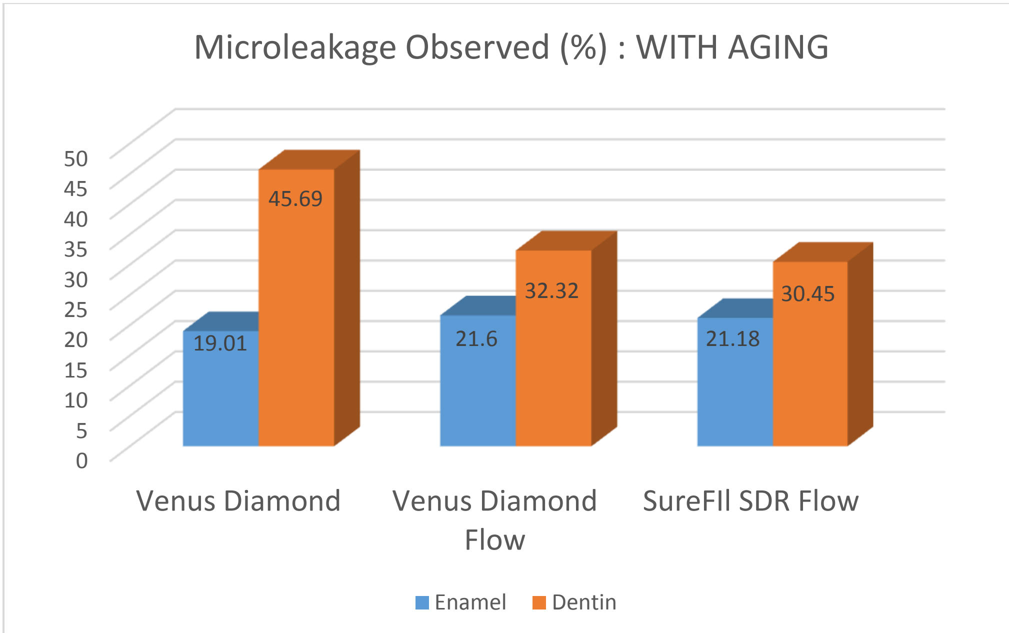
OBJECTIVE: The aim of this in vitro study was to evaluate the marginal sealing ability of bulk fill flowable resin composites on both enamel and dentin substrates: Venus Diamond (Heraeus Kulzer); Venus Diamond Flow (Heraeus Kulzer) and Surefil SDR (Dentsply).

RESULTS:

The amount of infiltration was significantly lower for the enamel substrate compared with dentin (P = 0.0001) and in samples immediately immersed in methylene blue compared with those that were artificially aged (P = 0.011). The interaction between the composite material and the marginal substrate significantly affected dye penetration (P = 0.006).



Adaptation and Microleakage



CONCLUSIONS:

SureFil SDR Flow and Venus Diamond Flow provided significantly better marginal seal in dentin, both before and after artificial aging. All three materials showed similar microleakage values at enamel margins.

Marginal adaptation of class II cavities restored with bulk-fill composites.

Campos EA, Ardu S, Lefever D, et al. J Dent 2014;42(5):575-81[21]

IADR 2012, Abstract#2316 [22]

OBJECTIVE: To determine the marginal adaptation of bulk-fill composites in class II MO cavities on extracted teeth. The teeth were restored with two horizontal increments of composite (4mm and 2mm thickness). The experimental groups were (1st/2nd increment): Gr1 Venus Bulk-Fill/Venus Diamond; Gr2 Tetric EvoCeram BulkFill/Tetric EvoCeram; Gr3 Surefil SDR/Ceram-X; Gr4 Kavo/SonicFill; Gr5 Ceram-X/Ceram-X (control).

RESULTS:

In enamel, no significant differences were detected before and after thermo-mechanical loading between groups. In dentin, the worst results were observed in Gr 1.

CONCLUSION:

SureFil SDR Flow and Tetric EvoCeram BulkFill exhibited better marginal adaptation than Venus BulkFill, and similar to the results of the standard composite. This provides further support for utilizing a bulk filling protocol for restoring teeth with SureFil SDR Flow.

Effect of bulk/incremental fill on internal gap formation of bulk-fill composites.

Furness A, Tadros MY, Looney SW, Rueggeberg FA. J Dent 2014;42(4):439-49 [23]

AADR 2012, Abstract#459 [24]

OBJECTIVE: To examine the effects of composite type (bulk-fill/conventional) and placement (4-mm bulk/2-mm increments) on internal marginal adaptation of Class I preparations.

Bulk-fill materials [SureFil SDR Flow (SDR), Quixx (QX), SonicFill (SF), Tetric EvoCeram Bulk (TEC)] were compared to a conventional composite designed for 2-mm increments (Filtek Supreme Ultra (FSU)).

RESULTS:

Marginal integrity was unaffected by placement method. Bulk-placement demonstrated significantly fewer gap-free margins at the pulpal floor than in enamel, for all materials except SDR. Greater percentages of gap-free margins were found within the mid-dentine than at the pulpal floor for FSU. QX had more gap-free margins in enamel compared with the mid-dentine. Proportion of gap-free margins within enamel and mid-dentine was not significantly different for any incrementally placed product. Excluding FSU, gap-free margins within enamel were significantly greater than at the pulpal floor. Notably, significantly more gap-free margins were found within mid-dentine than at the pulpal floor for SF.

CONCLUSION:

No significant differences in gap-free margins were found between placement methods within a given product per location. Except for SureFil SDR Flow, percentage of gap-free margins was significantly lower at the pulpal floor interface than at the enamel interface for bulk-fill.

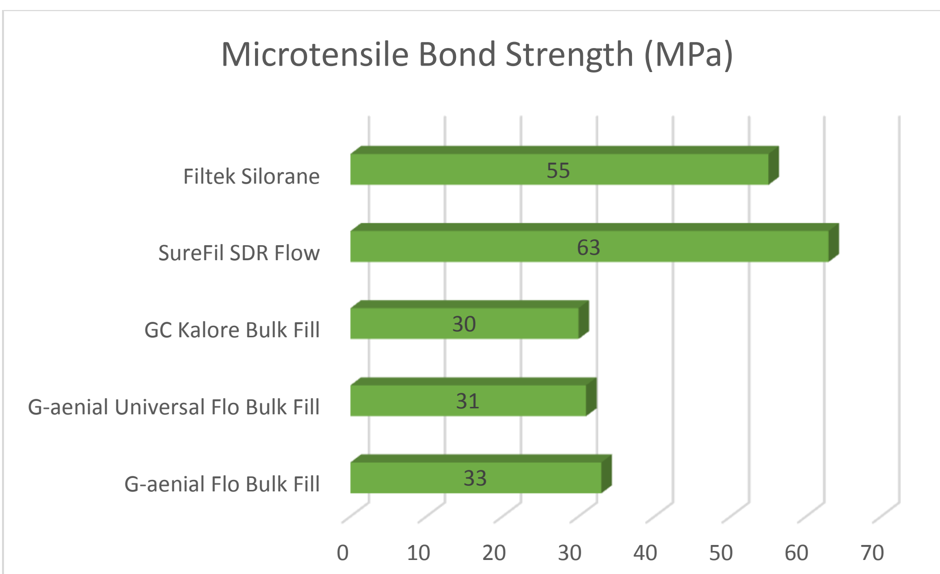
Microleakage of Class II restorations and microtensile bond strength to dentin of low-shrinkage composites.

Juloski J, Carrabba M, Aragoneses JM, et al. Am J Dent 2013; 26(5):271-7 [25]

OBJECTIVE: To evaluate the microleakage of Class II cavities restored with experimental low-shrinking resin composites proposed for bulk filling and to measure their microtensile bond strength (microTBS) to dentin and compare to those of previously marketed low-shrinkage composites.

Five materials were tested: SureFil SDR flow (SDR), Filtek Silorane (FS) and experimental materials (G-aenial Flo bulk fill, GF; G-aenial Universal Flo bulk fill, GUF; GC Kalore bulk fill, GK).
RESULTS:

Microleakage was not observed at the enamel interface in any of the groups. At the dentin interface, SDR recorded higher microleakage than the other materials. SureFil SDR Flow provided the highest microtensile bond strength values compared to other composite tested. No direct association between the sealing properties and the bond strength values was observed.



CONLCUSION: SureFil SDR flow scored excellent over other materials tested for microtensile bond strength. Higher microleakage was reported at the dentin interface than at the enamel interface.

Influence of flowable composite and restorative technique on microleakage of class II restorations.

Hernandes NM, Catelan A, Soares GP, et al. J Investig Clin Dent 2013. [26]

OBJECTIVE: The aim of the present study was to evaluate the microleakage in class II cavities restored with dental composite by varying the thickness of two flowable composite resins and the restorative technique. The two flowable composites tested were Filtek Z350 Flow (Z350F) and SureFil SDR Flow (SUR).

RESULTS:

There was no significant difference between the two flowable composites ($P > 0.05$). The restorative techniques (flowable composite applied at the cavosurface angle or DEJ) influenced microleakage and were flowable composite dependent ($P \leq 0.05$). The lower thickness of the flowable composite provided less microleakage ($P \leq 0.05$).

CONCLUSION:

The use a lower thickness of a flowable composite resin provided less microleakage, suggesting a better sealing tooth-restoration interface.

Within the limits of this study, SureFil SDR Flow and Filtek Z350 Flow allowed comparable reduction in microleakage.

3D assessment of void and gap formation in flowable resin composites using optical coherence tomography.

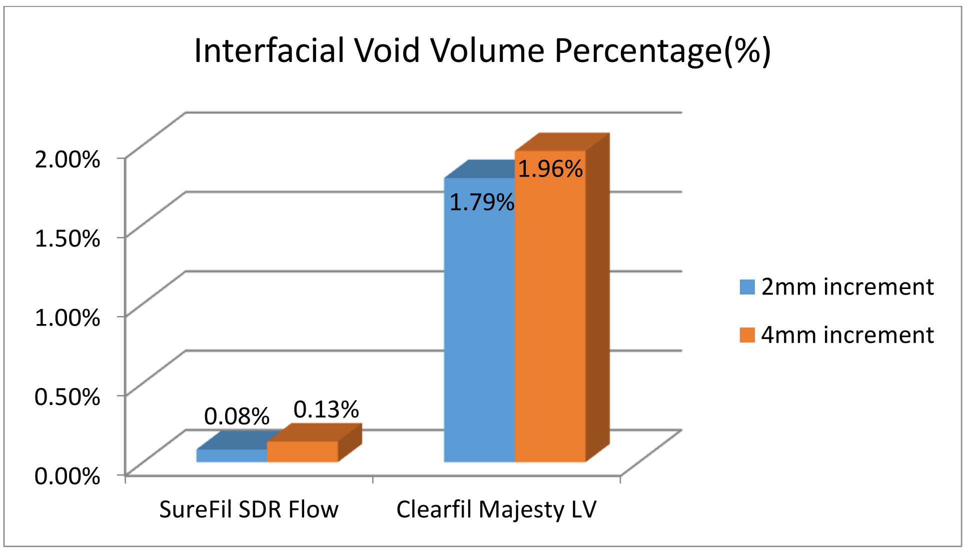
Nazari A, Sadr A, Shimada Y, Tagami J, Sumi Y. J Adhes Dent 2013;15(3):237-43.[27]

AADR 2012, Abstract#162 [28]

OBJECTIVE: To investigate the effect of composite type and cavity size on gap and void formation using optical coherence tomography (OCT).

Two bulk filled materials were tested in the 2mm and 4mm incremental curing protocol: Surefil SDR Flow (SF; Dentsply) or Clearfil Majesty LV (MJ; Kuraray Medical)

RESULTS:



Both composites showed a significant increase in gap formation at 4-mm cavity depth ($p < 0.001$). While SF showed a rather homogeneous bulk compared to MJ, cavity depth did not significantly affect the void volume fraction ($p = 0.08$).

CONCLUSION: SureFil SDR Flow with SDR (stress-decreasing resin) technology performed better than the conventional composite; however, bulk filling a 4-mm-deep cavity will compromise the sealing of the bonding interface regardless of the type of composite.

Marginal quality of flowable 4-mm base vs. conventionally layered resin composite.

Roggendorf MJ1, Krämer N, Appelt A, Naumann M, Frankenberger R. J Dent. 2011 Oct;39(10):643-7.[29]

OBJECTIVE:

This study evaluated marginal integrity of bonded posterior resin composite fillings to enamel and dentin with and without 4mm flowable base, before and after thermo-mechanical loading (TML).

Direct resin composite restorations (SDR with CeramX mono, Tetric EvoCeram, Filtek Supreme XT, and Venus Diamond or the respective resin composites alone) were bonded with system immanent adhesives XP Bond, Xeno V, Syntac, Adper Prompt L-Pop, and iBond self-etch.

RESULTS:

In both enamel and dentin, high percentages of gap-free margins were initially identified for all adhesives. After TML, etch-and-rinse adhesives performed better than self-etch adhesives ($p<0.05$). The presence of a 4mm layer of SDR had no negative influence on results in any group ($p>0.05$).

CONCLUSION:

SureFil SDR Flow as 4mm bulk fill dentin replacement showed a good performance with the material combinations under investigation.

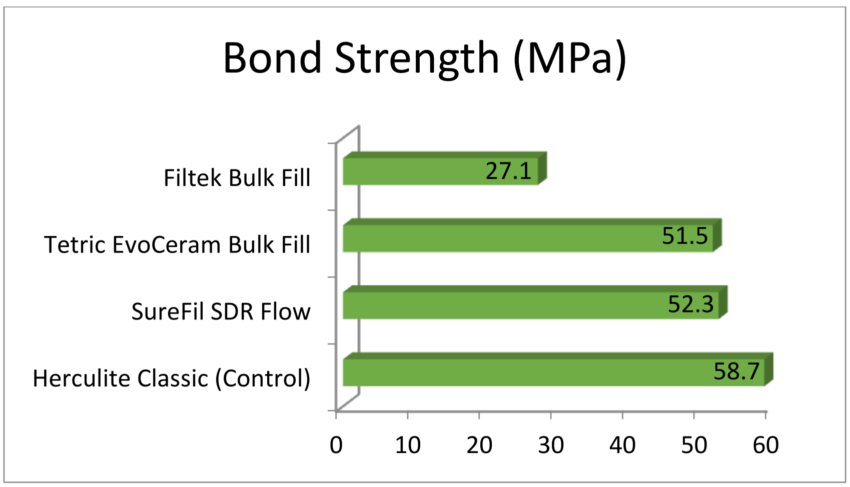
Adhesion of Bulk Fill Restorative Systems in Class I Cavities

B.M. Fronza, A.P.A. Ayres, G.M.B. Ambrosano, F.A. Rueggeberg, and M. Giannini. AADR 2014, Abstract#460 [30]

OBJECTIVE: To evaluate the resin-dentin bond strength of bulk fill restorative systems in class I cavities.

Four bulk filled composites were tested following manufacturer instructions: XP Bond + Surefil SDR Flow, Dentsply (S); Tetric N-Bond + Tetric EvoCeram Bulk Fill, Ivoclar Vivadent (T) and Universal Bond + Filtek Bulk Fill, 3M ESPE (F). The control group was OptiBond FL + Herculite Classic, Kerr (H) applied incrementally (oblique technique)

RESULT: There was no statistical difference among H, S and T. Filtek Bulk Fill presented the lowest dentin bond strength.



CONCLUSION: The bond strength of SureFil SDR Flow demonstrated to be as effective as incremental technique. Etch-and-rinse adhesive systems used with bulk fill composites (S and T) yielded higher bond strength than that presented for the self-etching system (F).

Marginal Assessment of Cavities Restored with a Low-stress Bulk-filling Composite

A.F. Reis, R.S. De Alexandre, S. Bertrand, Q. Dai, and X. Jin. AADR 2010, Abstract#654 [31]

OBJECTIVE: The aim of this study was to evaluate microleakage, marginal integrity and gap formation on Class II MOD cavities restored with a novel low-stress bulk-filling low-viscosity composite (Surefil SDR Flow, Dentsply Caulk), and compare its performance with commercially available products.

Group 1	Prime&BondNT/SDR Flow/SDR restorative
Group 2	XenoIV/SDR Flow/SDR restorative
Group 3	Prime&BondNT/SDR Flow/EsthetX-HD
Group 4	XenoIV/SDR Flow/EsthetX-HD
Group 5	SingleBond2/ Filtek Supreme Plus Flowable/Filtek Supreme Plus, placed per DFU
Group 6	SingleBond2/Filtek Supreme Plus Flowable/Filtek Supreme Plus, bulk placed
Group 7	Filtek LS System, placed per DFU
Group 8	Filtek LS system, bulk placed

RESULTS: For the microleakage analysis, enamel margins always performed better than dentin margins. Conversely, marginal integrity on dentin margins was better than enamel margins. Except for G6, all groups presented a similar behavior with regard to microleakage and internal gap formation. Except for G6 and G8, the percentage of gaps formed around cavity margins was not significantly different.

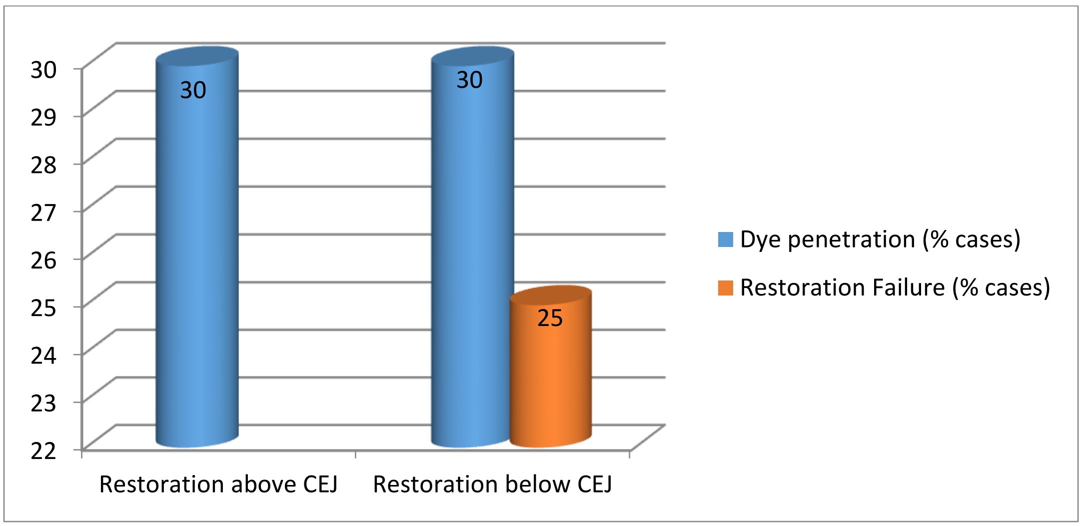
CONCLUSION: The performance of SureFil SDR Flow with regard to microleakage, marginal integrity and internal gap formation was similar to commercially available products.

The marginal seal of class II restorations using bulk-fill composite

P. Segal, S. Matalon, S. Levartovsky and A. Ben-Amar. IADR 2013, Abstract#180318 [32]

OBJECTIVE: The objective of this study was to compare the marginal seal of the bulk fill flowable composite, Surefil SDR, at the gingival margins of class II restorations occlusally and apically to the CEJ.

RESULTS:



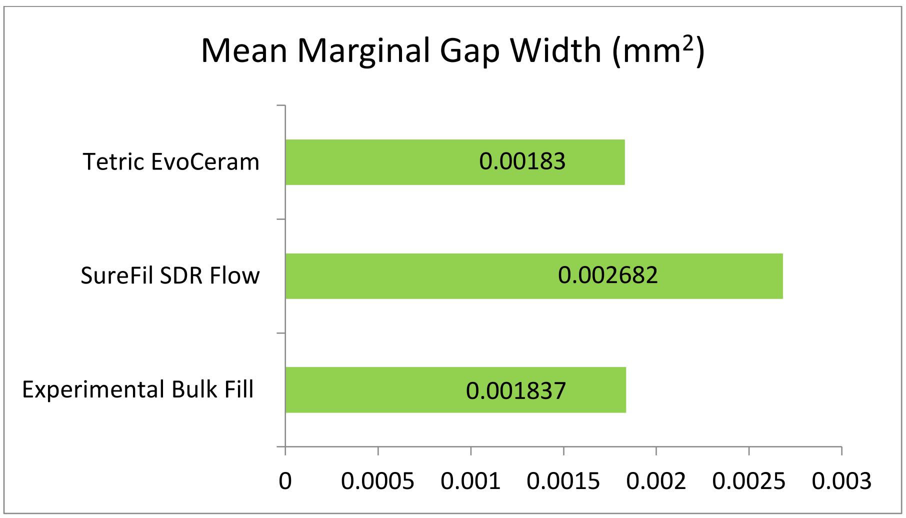
CONCLUSION: The Surefil SDR provides a better marginal seal in class II restorations with gingival margins above the CEJ, but failed to totally seal the restorations margins in both groups tested.

Marginal Adaptation of New Bulk Fill Composites: Microscopical Evaluation

A. Zubani, F. Bassi, E. Nembrini, P.A. Acquaviva, and A. Cerutti. IADR 2012, Abstract#385 [33]

OBJECTIVE: Aim of this study was to investigate the cavity margin adaptation of three composites using optical microscope and software evaluations. Materials tested were a new experimental bulk-filling composite (G1), Surefil SDR Flow/Dentsply (G2) and Tetric Evoceram/ Ivoclar-Vivadent (G3)

RESULTS: No significant differences were found between groups (p=0.252).



CONCLUSION: The newly-introduced lamp-dependent material designed for bulk application may afford good marginal adaptation while saving more time if compared with bulk composite materials and much more with layering technique materials.

SureFil SDR Flow performed at par with the other materials tested in terms of marginal adaptation to cavity walls.

Microleakage of Class II Preparations Restored With The SonicFill System

C. Munoz-Viveros, A.R. Yazici, I. Agarwal, and M. Campillo-Funollet.

AADR 2012, Abstract#466 [34]

OBJECTIVE: To compare SonicFill's microleakage with other conventional composite resins.

Three groups: A: SonicFill + Optibond AIO (Kerr), B: SureFil SDR + Xeno IV + Ceram X (Dentsply) and C:Filtek Supreme Ultra + Adper Easy Bond (3M).

RESULTS: Microleakage scores were not found to be significantly different among the materials for the occlusal microleakage (p=0.919) or for the cervical microleakage (p=0.747). Overall microleakage, considering the maximum score from either cervical or occlusal for each sample, did not show significant differences either (P=0.541). None of the restorations had a score of 4.

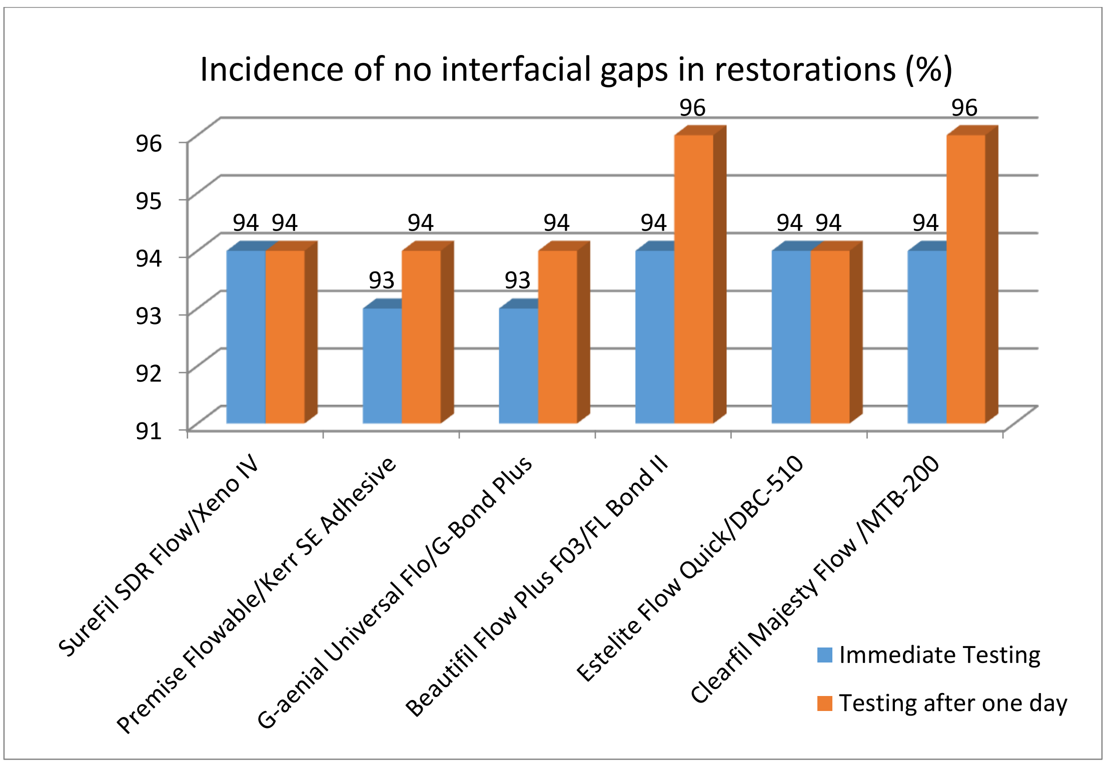
CONCLUSIONS: SonicFill had similar microleakage to SureFil and Supreme and can be recommended to be used in bulk fill. This study was partially funded by Kerr Corporation.

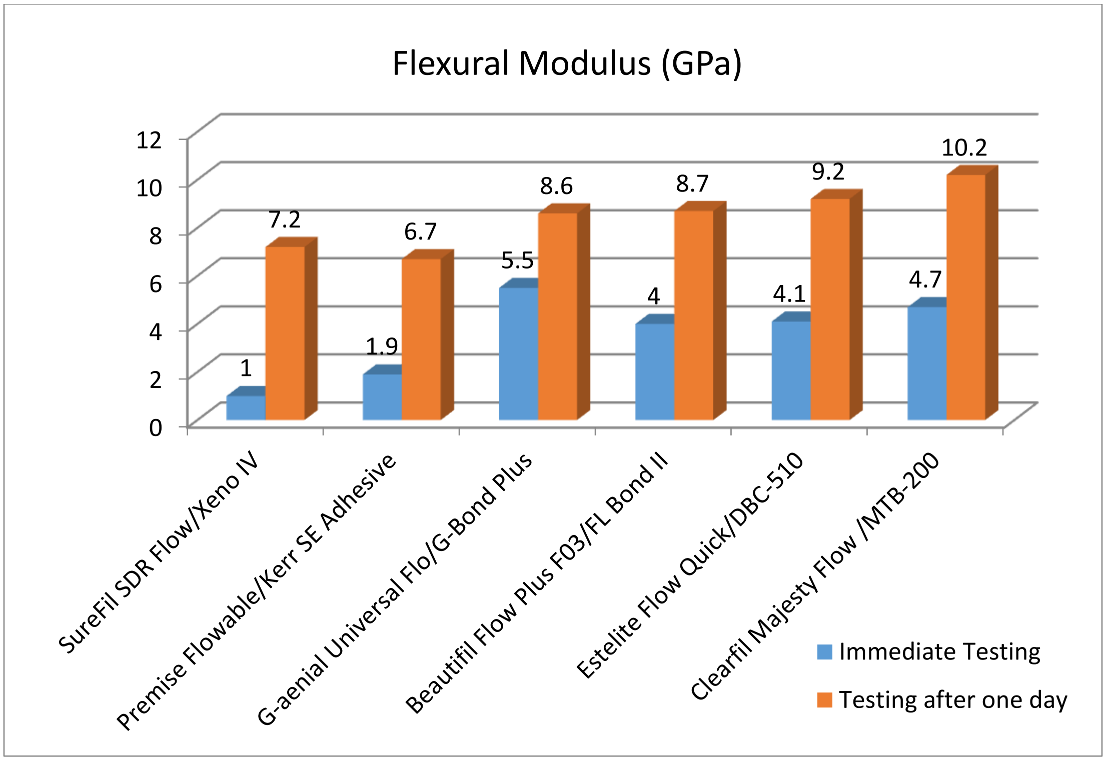
Early No Interfacial-Gap Incidence vs. Flexural Modulus with Injectable Composites

M. Irie, Y. Tamada, Y. Maruo, G. Nishigawa, M. Oka, S. Minagi, K. Suzuki, and D.C. Watts. IADR 2011, Abstract#3203 [35]

OBJECTIVE: A major research concern is the relationship between the no interfacial-gap incidence in restorations (NG) and their flexural modulus (FM) (Dent Mater 2010; 26: 608-615). This study was analyzed the relationship between NG and FM with injectable composites/self-etching adhesives [SureFil SDR Flow/Xeno IV, Dentsply/Caulk (SX); Premise Flowable/Kerr SE Adhesive System, Kerr (PK); G-aenial Universal Flo/G-Bond Plus, GC (GG); Beautifil Flow Plus F03/FL Bond II, Shofu (BF); Estelite Flow Quick/DBC-510, Tokuyama (ED); Clearfil Majesty Flow /MTB-200, Kuraray (CM)].

RESULTS:





CONCLUSION: There was no relationship between flexural modulus and incidence of no interfacial gaps in restorations for injectable composites.

Microleakage Evaluation of Bulk-Fill Layering Techniques in Class II Restorations

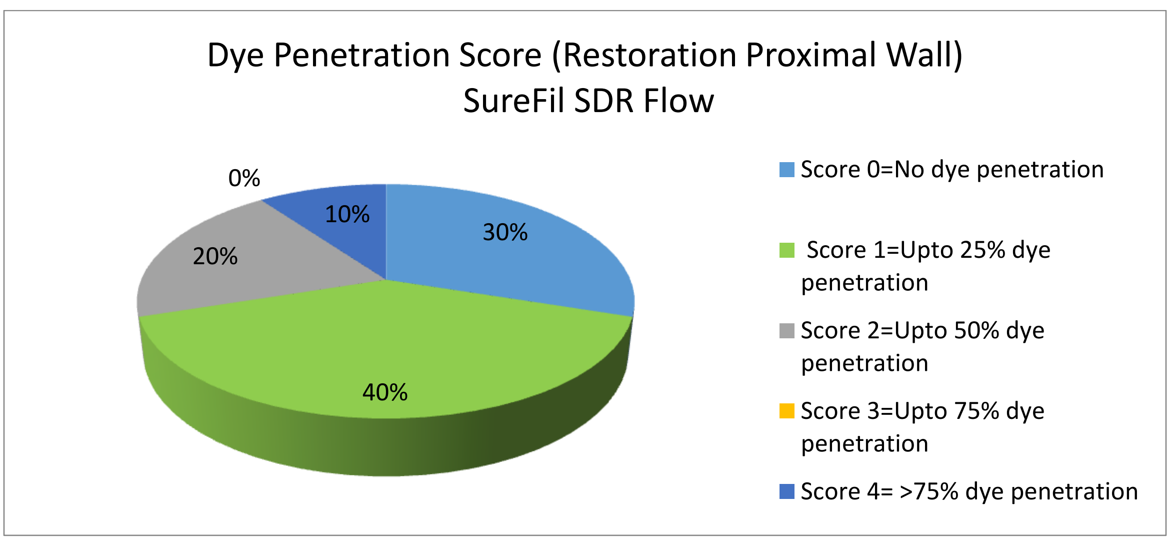
M.K. Kreitzer, M. Harsono, M. Finkelman, and G. Kugel. IADR 2013, Abstract#3554 [36]

OBJECTIVE: The purpose of this study is to evaluate bulk-fill (BF) composites in Class II restorations.

Group (n = 10)	Composites
1 - Control	Filtek Supreme (3M ESPE)
2 – BF	Venus Bulk Fill, Flowable (Heraeus)
3 – BF	Filtek Supreme Plus Flow Restorative (3M ESPE)
4 - BF	Surefil SDR Flowable (Denstply)
5 - BF	Tetric EvoCeram Bulk Fill (Ivoclar Vivadent)

RESULTS:

Dye Penetration (DP) Score	Group 1	Group 2	Group 3	Group 4	Group 5
0 = No dye penetration (DP)	0 / 0	4 / 5	7 / 7	1 / 3	6 / 6
1 = DP to 25% of gingival floor (GF) / Proximal Wall (PW)	0 / 2	4 / 1	3 / 1	1 / 4	3 / 3
2 = DP to 50% of GF / PW	0 / 2	1 / 1	0 / 0	2 / 2	0 / 1
3 = DP to 75% of GF / PW	2 / 2	0 / 0	0 / 2	2 / 0	1 / 0
4 = DP to axial wall / pulpal floor	8 / 4	1 / 3	0 / 0	4 / 1	0 / 0



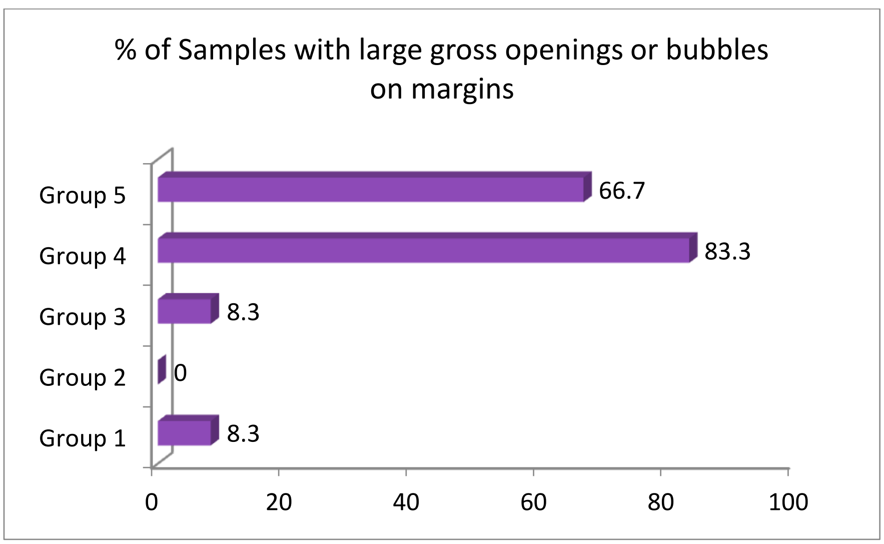
CONCLUSIONS: Based on the statistical results there was a significant difference between using bulk-filled composites as compared to using solely a non-flowable nanocomposite. It was also evident that using a bulk filling technique provides better marginal adaptation on the gingival floor and proximal wall of the restorations. This validates the bulk filled protocol of SureFil SDR Flow, which thereby reduces chair side time and manipulation.

Insertion Technique and Marginal Adaptation of Class II Composite Restorations

A. Murray, C. Bergeron, F. Qian, R. Nessler, and M. Vargas. IADR 2011, Abstract#3206 [37]

OBJECTIVE: To determine the effect of different insertion techniques on the marginal adaptation of Class II resin composite restorations in-vitro.

Group 1	Snowplow technique: applied a thin layer of flowable composite, Estelite Flow Quick (EFQ), without light curing, followed by 2mm increments of Estelite Sigma Quick (EQ) composite.
Group 2	Same as Group 1, with light curing of EFQ
Group 3	One 2-4mm increment of low shrinkage composite, Surefil SDR Flow, followed by a 2mm increment of EQ
Group 4	Preheating the first 2mm increment of EQ with a CALSET Compule Heater, followed by 2mm increments of room temperature EQ
Group 5	Control: successive 2mm increments of EQ.



CONCLUSION: Based on the results, the use of Surefil SDR Flow or Estelite Flow Quick (cured or uncured) improved marginal adaptation compared to preheating Estelite Sigma Quick (EQ) or using a conventional insertion technique.

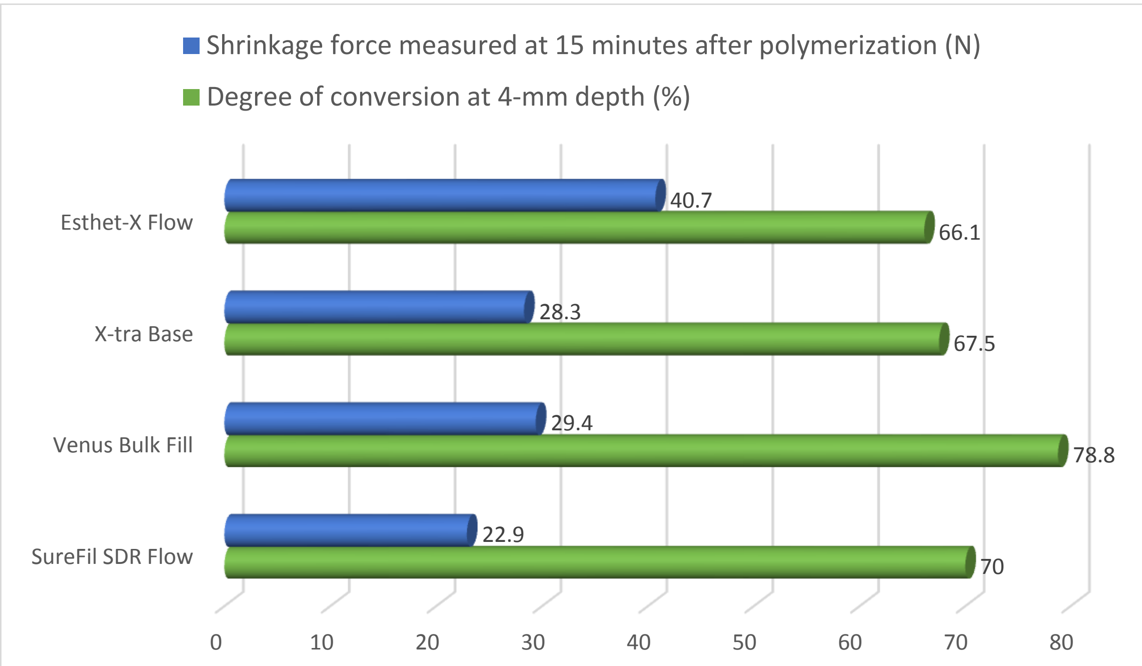
C. DEPTH OF CURE

Monomer conversion and shrinkage force kinetics of low-viscosity bulk-fill resin composites.

Marovic D1, Tauböck TT, Attin T, Panduric V, Tarle Z. Acta Odontol Scand. 2014 Dec 29:1-7.[38]

OBJECTIVE: To investigate the subsurface degree of conversion and shrinkage force formation of flowable bulk-fill composite materials.

RESULTS:



CONCLUSION: SureFil SDR Flow showed the lowest shrinkage force formation at 15 minutes after polymerization. Venus Bulk Fill, SureFil SDR Flow and X-tra Base showed high levels of degree of conversion up to 4-mm incremental thickness than the conventional flowable composite Esthet-X Flow.

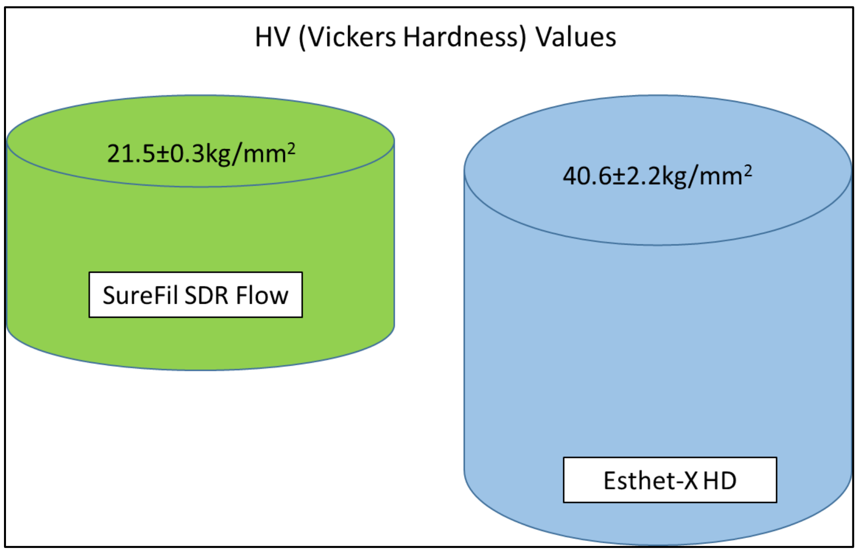
Comparing Depth-dependent Curing Energy Density of Bulk-fill and Conventional Composites

Tenorio IP, Rabello de Mello GB, Reis AF, Rodrigues JA, Shen C, Roulet J.

IADR 2015, Abstract #0667[39]

OBJECTIVE: This study investigated the effect of curing depth on the energy density required for curing a flowable bulk-fill composite resin (SureFil SDR Flow) to reach the maximum cure compared to a conventional composite (control: Esthet-X HD).

RESULTS: The time needed and energy delivered to SDR were 7, 13 and 24s, and 11, 20 and 37J/cm2 for 2, 4 and 6mm thickness. The time needed and energy delivered to Esthet-X HD were 32, 133 and 506s, and 50, 206 and 784 J/cm2 for 2, 4 and 6mm thickness.



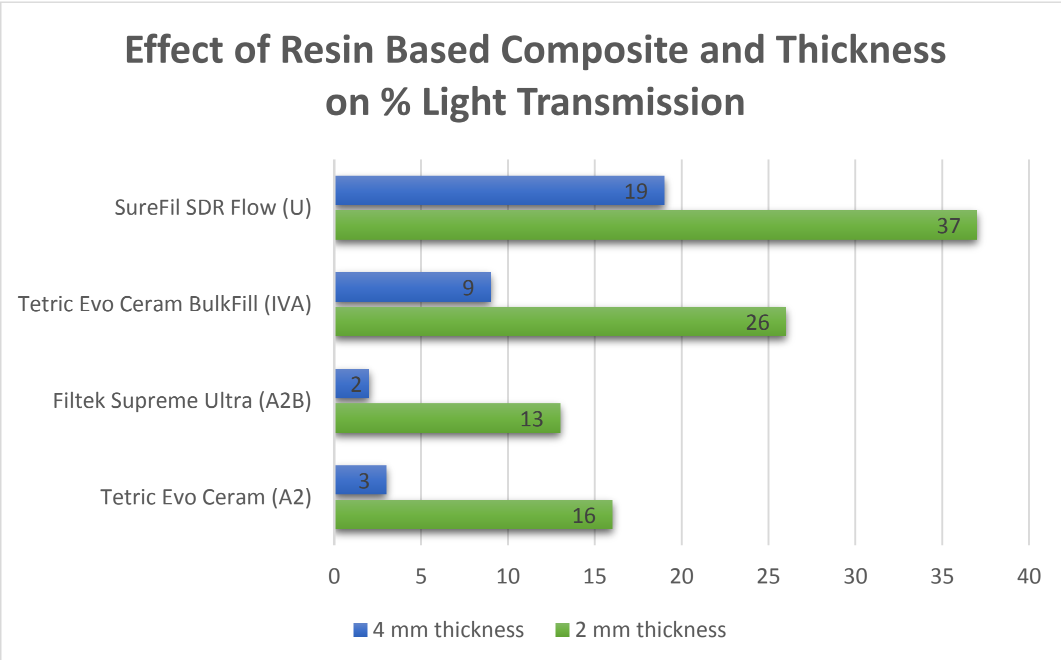
CONCLUSION: Attenuation capacity among composite resin is different. Thickness of specimens further complicated the energy required to yield adequate curing.

Light transmission through conventional and bulk filling resin based composites.

Harlow J, Sullivan B, Price RB, Labrie D. IADR 2015, Abstract #0668[40]

OBJECTIVE: To evaluate the spectral radiant power transmitted through four resin based composites (RBC) using a polywave (violet/blue) curing light.

RESULTS:



CONCLUSION: The two bulk filling RBCs (SureFil SDR Flow and Tetric EvoCeram Bulk Fill) allowed two to three times more light through than the conventional RBCs.

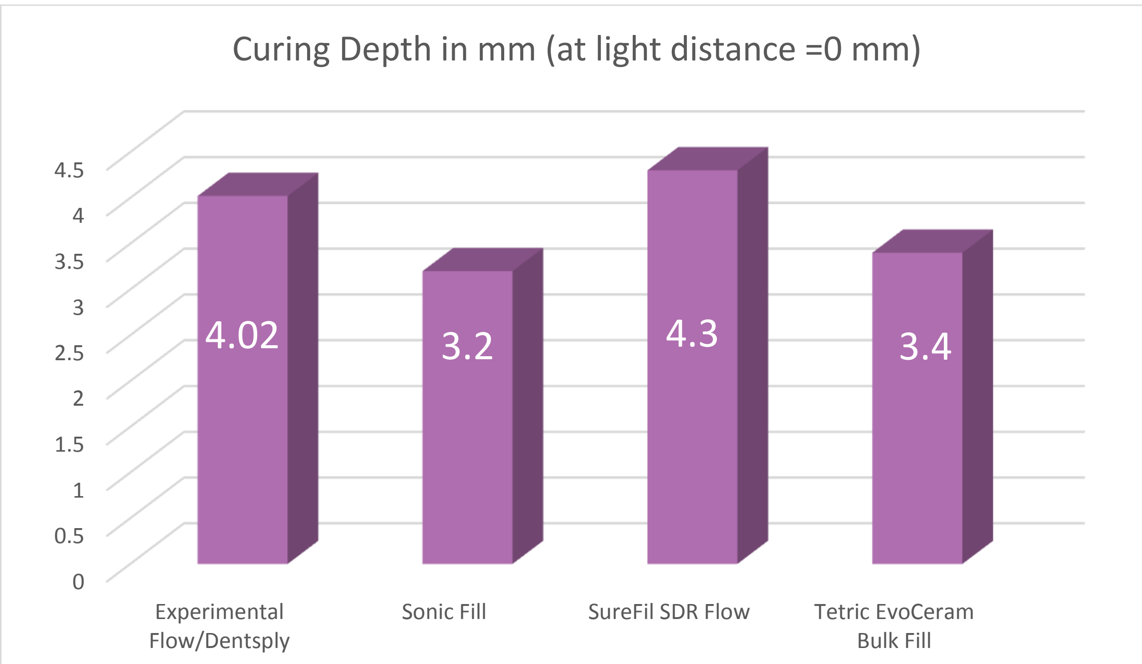
Effect of Curing Distances on the Bulk-fill Composites

Bui M, Mariano A, Harsono M, Janyavula S, Perry RD, Kugel G. IADR 2015, Abstract #2202[41]

OBJECTIVE: To compare and evaluate the effect of curing distances on the polymerization of several bulk-fill composites at clinically relevant distances using two different curing lights.

RESULTS:

The depth of cure had the largest drop when comparing the light source from 0mm to 5mm and the smallest decrease when comparing the light source from 3mm to 5mm



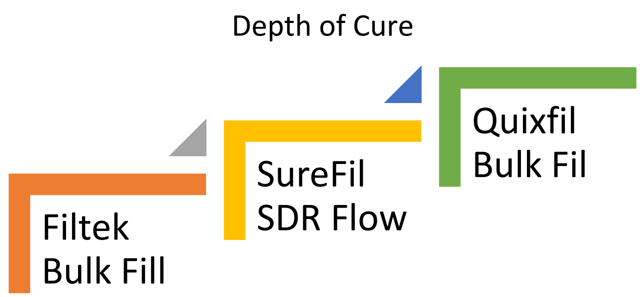
CONCLUSION: The further away the light source was from the composite, the less the composite was polymerized.

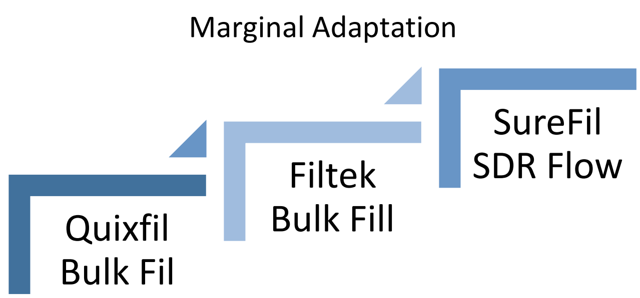
Depth of cure and adaptation of bulk-fill resin composites.

Kabil SH, Yousri M, Harhash AY. IADR 2015, Abstract #2203[42]

OBJECTIVE: To determine the depth of cure and the adaptation to cavity walls of three bulk-filled composite materials

RESULTS:





CONCLUSION:

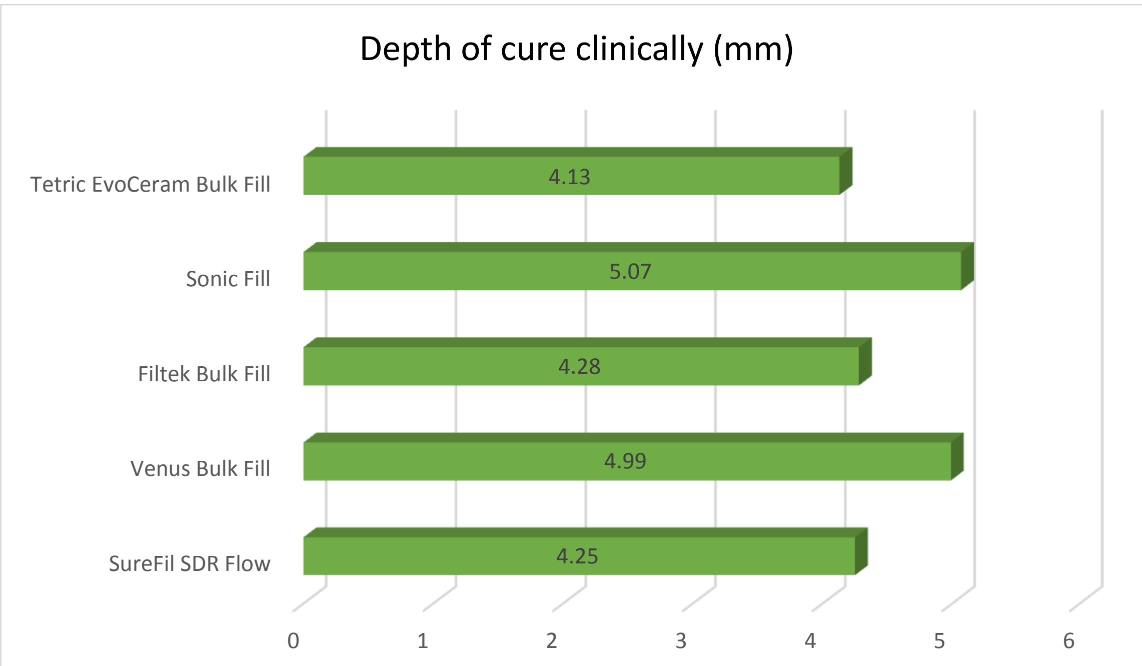
Condensable composite resin showed high depth of cure. High molecular weight methacrylate monomer technology composite resin reveals good adaptation.

Clinically-relevant measurements of depth of cure of bulk-fill composites

Tiba A, Vinh R, Estrich C. IADR 2015, Abstract #2204[43]

OBJECTIVE: To determine and compare the depth of cure (DOC) of bulk-fill composite resins measured by a more clinically-relevant procedure versus the standard ISO 4049 measurement and bottom/top hardness ratio (H).

RESULTS:



CONCLUSION: Quixx and Sonic Fill had the highest and significantly similar depth of cure among all composites tested. The tooth structure allowed light beam transmittance that produced a 20% deeper DOC on average across all products tested compared to the stainless steel mold used in the standard ISO 4049.

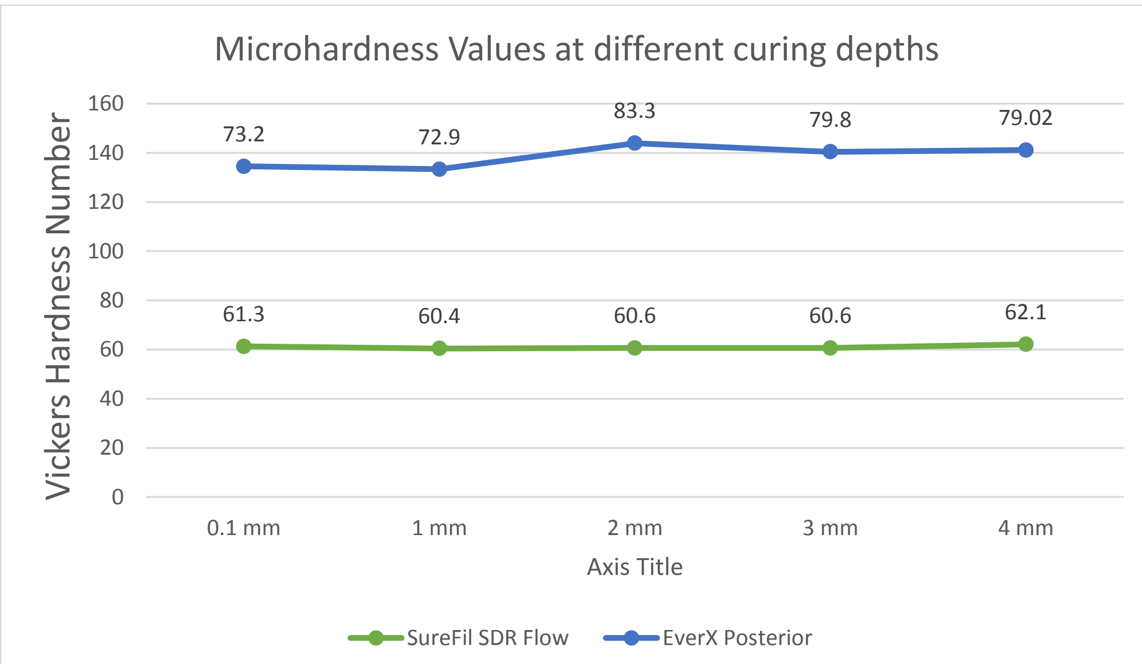
Comparison of microhardness and curing depth of two bulkfill dentin materials.

Alptosunoğlu E, Boztas G, Yildirim G, Ozcan S, Uctasli MB, Lassila L, Bijelic-Donova J

IADR 2015, Abstract#2205[44]

OBJECTIVE: To evaluate curing depth of a short fiber composite intended for posterior large restorations (everX Posterior,GC,Leuven,Germany) in comparison to other dentin composite (SDR,Dentsply,York,USA).

RESULTS:



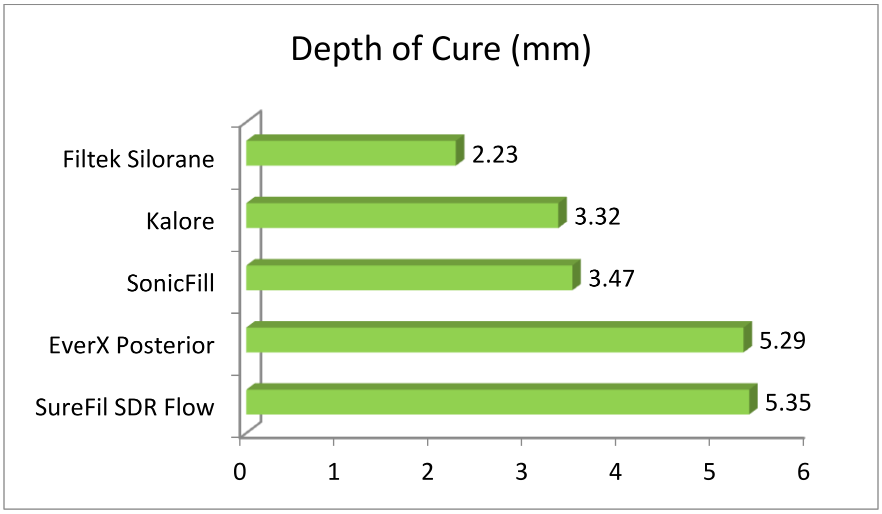
CONCLUSION: EverX Posterior and SDR exhibited depth of cure over 4mm thickness recommended for bulk placement. Microhardness and polymerization of composites are not influenced by depth.

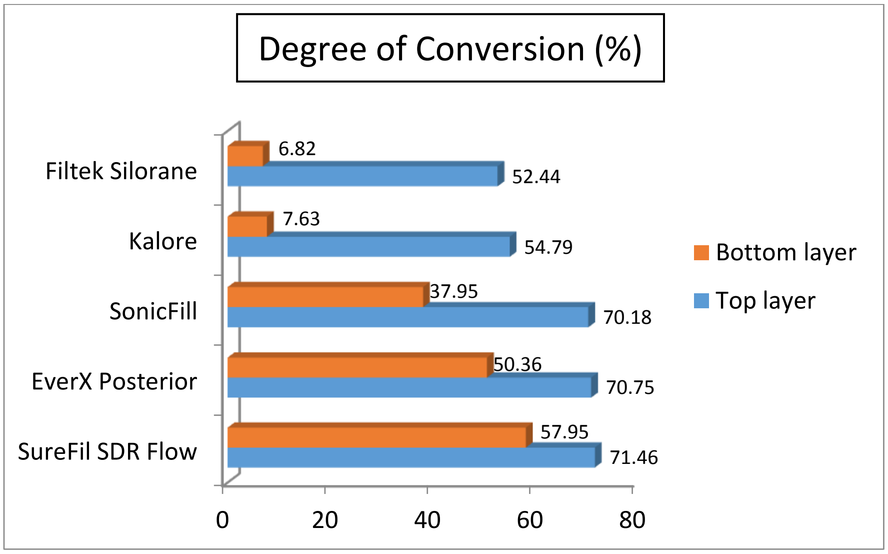
Polymerization efficiency and flexural strength of low-stress restorative composites.

Goracci C, Cadenaro M, Fontanive L, et al. Dent Mater 2014; 30(6):688-94.[45]

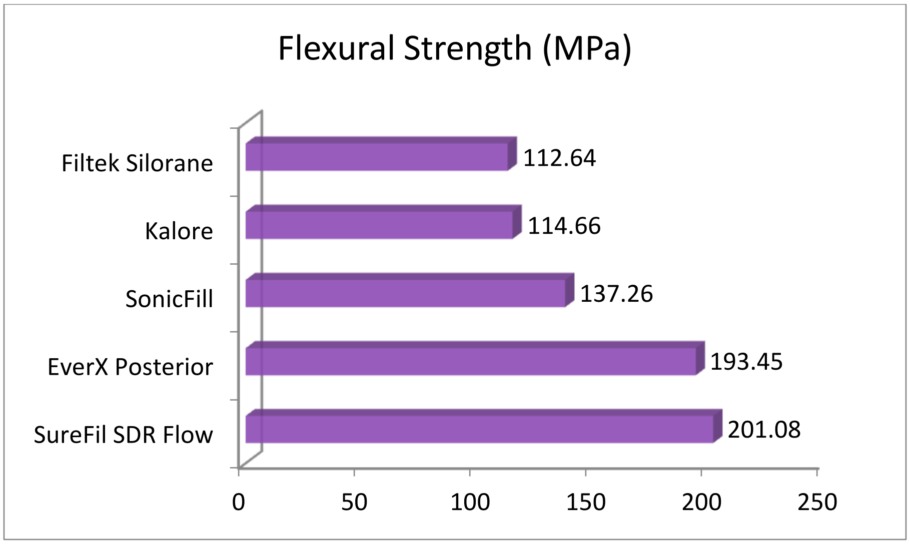
OBJECTIVE: To assess depth of cure (DOC), degree of conversion (DC), and flexural strength (FS) of several resin composites with low-stress behavior. SonicFill (Kerr), SureFil SDR Flow (Dentsply), everX Posterior (GC), Kalore (GC), and Filtek Silorane (3M ESPE) were tested.

RESULTS:





Depth of Cure



CONCLUSION: SureFil(®) SDR™ and everX Posterior exhibited DOC over 4mm, the maximum thickness recommended for bulk placement, while SonicFill recorded DOC values very close to the 4mm threshold. SonicFill achieved the highest DC at the irradiated surface, as well as at 4mm depth. SureFil(®) SDR™ demonstrated similarly uniform curing through the bulk increment. All the tested composites complied with the requirements of FS established by ISO 4049/2009.

Degree of conversion of bulk-fill compared to conventional resin-composites at two time intervals.

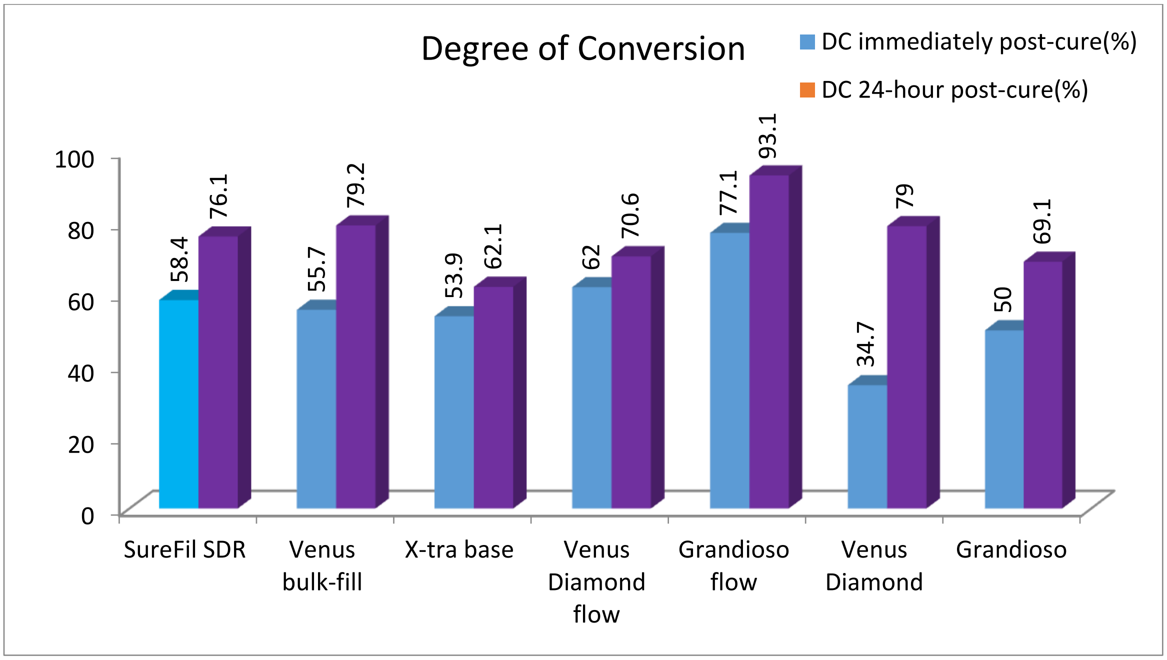
Alshali RZ, Silikas N, Satterthwaite JD. Dent Mater 2013; 29(9):e213-7.[46]

IADR 2013, Abstract#1906 [47]

OBJECTIVE: The purpose of this study was to assess the degree of conversion (DC) over time, using FTIR spectroscopy for bulk-fill flowable resin composite materials compared to conventional flowable and regular resin composite materials.

Eight resin composites were investigated including flowable bulk-fill materials SureFil SDR (SDR), Venus bulk-fill (VBF), X-tra base (XB), and Filtek Bulk Fill (FBF). Conventional flowable and regular composite materials included: Venus Diamond flow (VDF), Grandioso flow (GRF), Venus Diamond (VD), and Grandioso (GR).

RESULTS:



CONCLUSION:

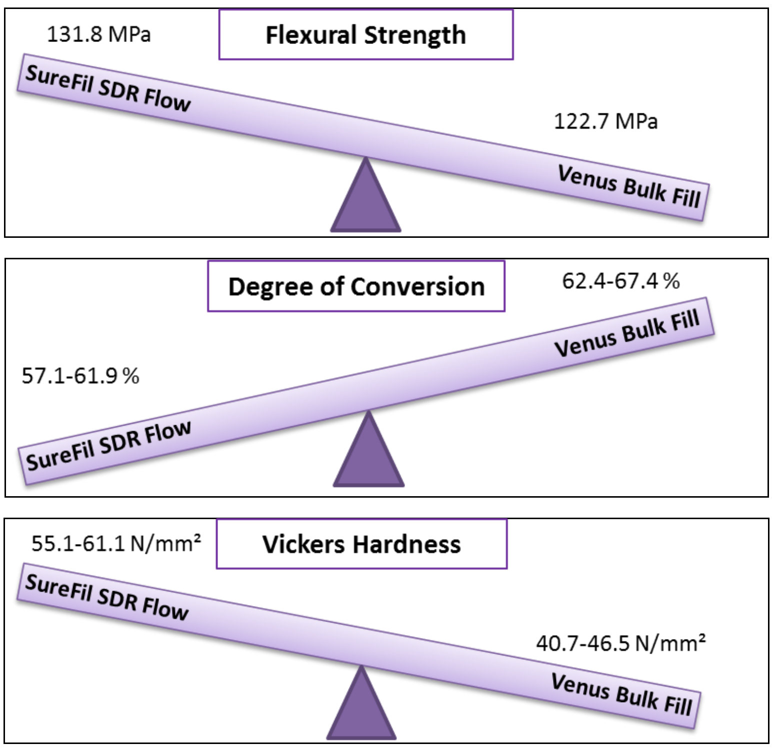
The 24h post-cure DC values of the bulk-fill composites SDR and VBF are generally comparable to those of conventional composites studied; however, the 24h post-cure DC values of XB and FBF were lower compared to the other materials.

In vitro comparison of mechanical properties and degree of cure of bulk fill composites.

Czasch P1, Ilie N. Clin Oral Investig. 2013 Jan;17(1):227-35.[48]

OBJECTIVE: The aim of our study was to measure and compare degree of conversion (DC) as well as micro- (indentation modulus, E; Vickers hardness, HV) and macromechanical properties (flexural strength, σ; flexural modulus, E (flexural)) of two recently launched bulk fill resin-based composites (RBCs): Surefil® SDR™ flow (SF) and Venus® bulk fill (VB).

RESULTS: Both RBCs showed high reliability (VB, m = 21.6; SF, m = 26.7) and a depth of cure of at least 6 mm at all polymerization times. The factor "RBC" showed the strongest influence on the measured properties (η (2) = 0.35-0.80) followed by "measuring depth" (η (2) = 0.10-0.46) and "polymerization time" (η (2) = 0.03-0.12).



CONCLUSION:

Significant differences between both RBCs were found for DC, E, σ, and E (flexural) at all irradiation times and measuring depths.

Curing SureFil SDR Flow in 4-mm bulks for 20 s can be recommended.

Depth of cure of resin composites: is the ISO 4049 method suitable for bulk fill materials?

Flury S, Hayoz S, Peutzfeldt A, Hüsler J, Lussi A. Dent Mater. 2012 May;28(5):521-8.[49]

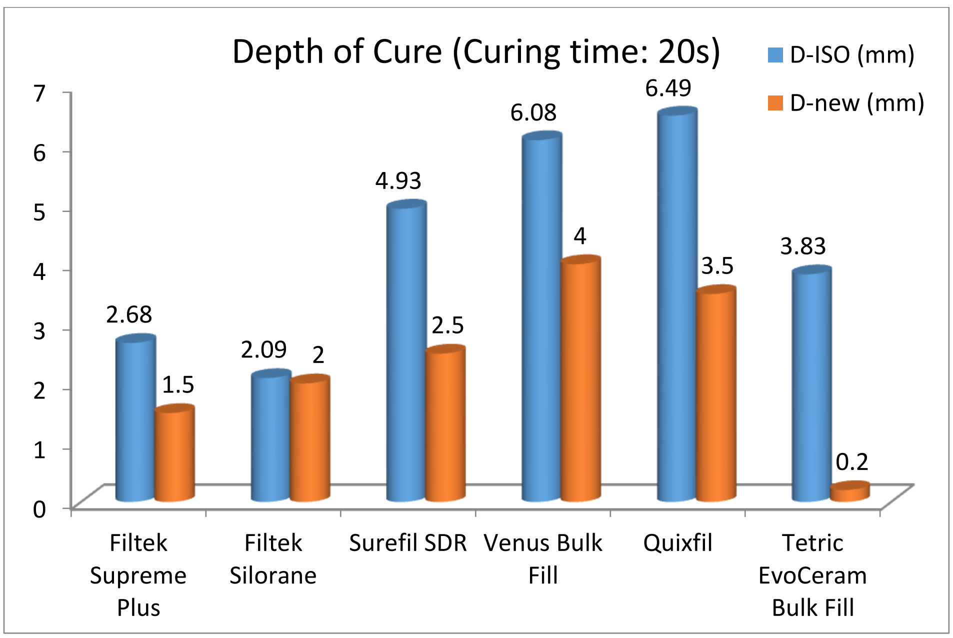
OBJECTIVE:

To evaluate if depth of cure D(ISO) determined by the ISO 4049 method is accurately reflected with bulk fill materials when compared to depth of cure D(new) determined by Vickers microhardness profiles.

Materials tested were two control materials (Filtek Supreme Plus, Filtek Silorane) and four bulk fill materials (Surefil SDR, Venus Bulk Fill, Quixfil, Tetric EvoCeram Bulk Fill).

RESULTS:

D(ISO) varied between 1.76 and 6.49 mm with the bulk fill materials showing the highest D(ISO). D(new) varied between 0.2 and 4.0 mm. D(new) was smaller than D(ISO) for all resin composites except Filtek Silorane.



CONCLUSION: For bulk fill materials the ISO 4049 method overestimated depth of cure compared to depth of cure determined by Vickers hardness profiles.

Transmission from Light-Cure Units and Bulk-Fill Composite Cure-Depths

D.C. Watts, A. Sadeghyar. AADR 2014, Abstract#179 [50]

OBJECTIVE: As part of a comprehensive investigation, we focus here on depth of cures (DoCs) from hardness-depth profiles for bulk-fill composites, in relation to their light absorption coefficients, with a single light-cure-unit (LCU).

Six bulk-fill composites were examined and assigned the codes: SDR-BF, TEC-BF, V-BF, XB-BF, F-BF, SF-BF. Two standard composites were studied for comparison: TEC and CX.

RESULTS: Maximum Vickers Hardness (Hv) varied within the range 40-80, depending on filler loading. Top-surface Hv was approximately invariant with mold depth (d). Bottom-surface Hv decreased gradually with increasing d, for BF materials, and DoC could be assigned - corresponding to 80 % of maximal Hv - which ranged from 3.3 to 5.5 mm. When light absorption coefficients (a) were derived (Watts: J Dent 1994, 22: 112-7) from the BF transmission data, excluding XB-BF, a negative linear regression was found (r = - 0.900) of DoC on a.

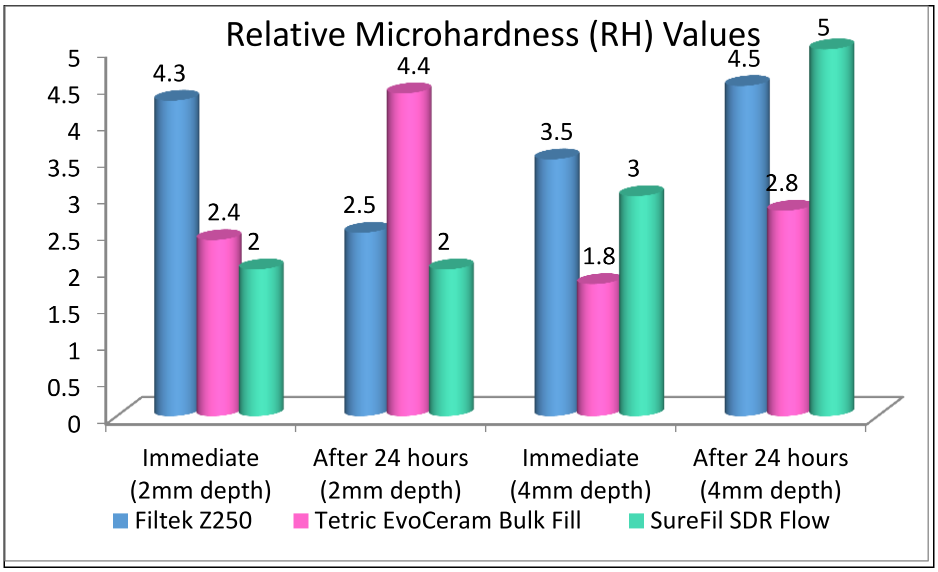
CONCLUSION: Measurement of 24 h bottom-hardness versus (Acetal) mold depth is a viable method of deriving Depth-of-Cure data, which for five BF composites varied approximately according to the light-absorption coefficient.

Depth of Cure of Two Bulk-fill Composites: Micro-hardness Analysis

H.M. El-Shamy and O. El-Mowafy. IADR 2014, Abstract#1496 [51]

OBJECTIVE: This study determined depth of cure by measuring relative microhardness (RH) of one microhybrid(Filtek-Z250) and two bulk-fill composites (Tetric EvoCeram Bulk-fill and SureFil SDR flow) immediately after curing and after 24 hours.

RESULTS:



ANOVA revealed no significant differences in mean RH values among the groups (P>.05). For all materials, RH values at 2mm depth of cure were > 80% (most desirable), while at 4mm depth of cure, RH values were < 80% but with no significant difference. Also, there was no significant difference for the effect of time up to 24 hrs on RH values.

CONCLUSION: SureFil SDR flow can be used with 4mm depth of cure. Storage time up to 24 hours didn't significantly affect RH values.

Effect of Thickness on the Properties of Bulk Cured Resins

M. Alshaafi, M.Q. Alqahtani, T. Haenel, R.B. Price, and J. Fahey. IADR 2013, Abstract#2434 [52]

OBJECTIVE: This study evaluated the effect of different thicknesses on the Degree of Conversion (DC) and Knoop microhardness (KHN) of posterior resin-based composites.

Five resin-based composite materials were evaluated: Tetric EvoCeram Bulk Fill (Ivoclar-Vivadent), SureFil SDR Flow (Dentsply), SonicFill (Kerr), X-traFil (Voco), and Kalore (GC).

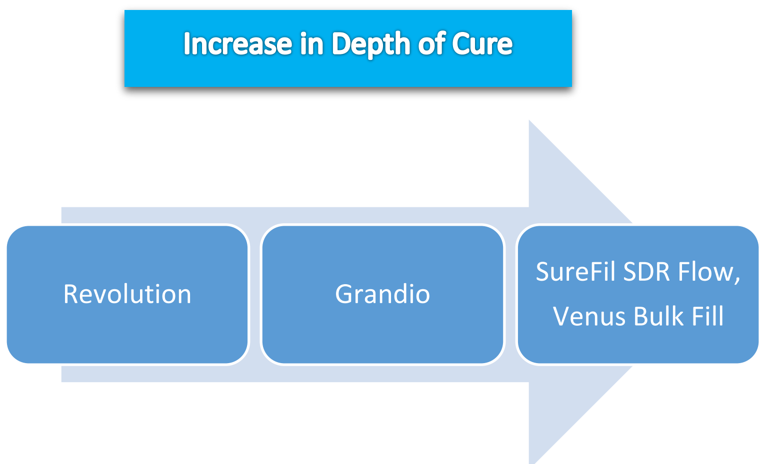
RESULTS: There was no significant difference in the microhardness values at the top of the 2, 4 and 6mm thick specimens. SureFil SDR was the softest resin and was the only resin that had no significant difference between the KHN values at 2 and 4mm, and marginally significant between 2 and 6mm (Mixed Model ANOVA $p<0.05$). X-traFil and SDR had no significant difference between the DC values at 2 and 4mm. It was not possible to measure the DC or KHN of 6mm thick Kalore and this material only claims a 3.5mm cure.

CONCLUSION: The four bulk filling showed no significant difference between the KHN values at the top and at the bottom of 2mm. In accordance with manufacturer's instructions, SureFil SDR Flow would be inadvisable to be cured in 6 mm thick increments.

Depth of Cure of New Flowable Composite Resins

I. Pedalino, K. Vandewalle, G. Hartup, and P. Rogers. AADR 2012, Abstract#254 [53]

OBJECTIVE: To evaluate the depth of cure of Surefil SDR Flow (Dentsply), Grandio Flow (VOCO) and Venus Bulk Fill (Heraeus) and a conventional flowable composite, Revolution (Kerr) using bottom/maximum Knoop Hardness Number (KHN) ratios and the scrape technique (ISO 4049).
RESULTS: In general, depth of cure using either bottom/maximum KHN or scrape technique: Venus ≥ SDR ≥ Grandio ≥ Revolution.



CONCLUSION: Venus Bulk Fill predictably exceeded the manufacturer's claim of a 4-mm depth of cure using both KHN ratios and the ISO 4049 scrape test at both 20 and 40 seconds of curing time.

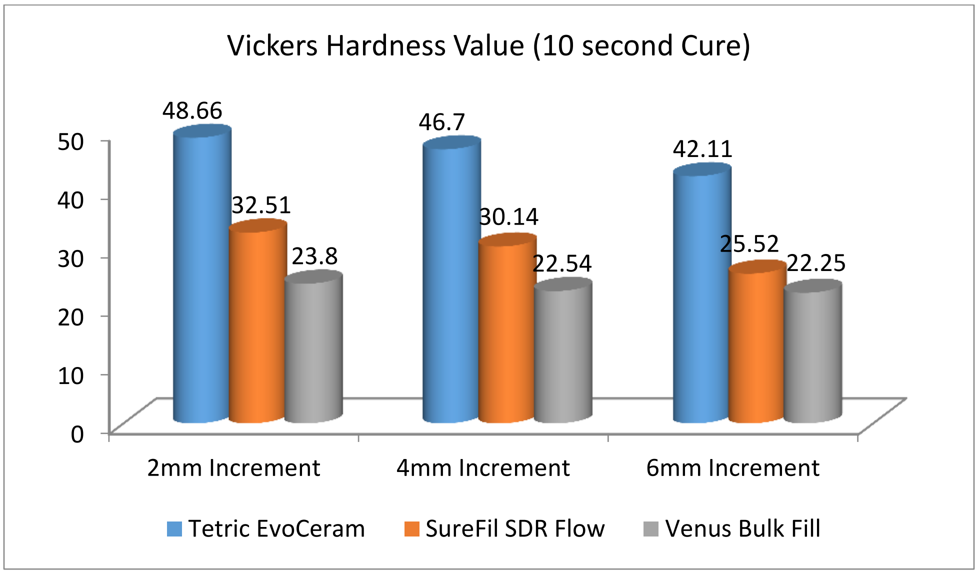
This study further validates the bulk filling protocol for SureFil SDR Flow, which considerably simplifies the restorative procedure.

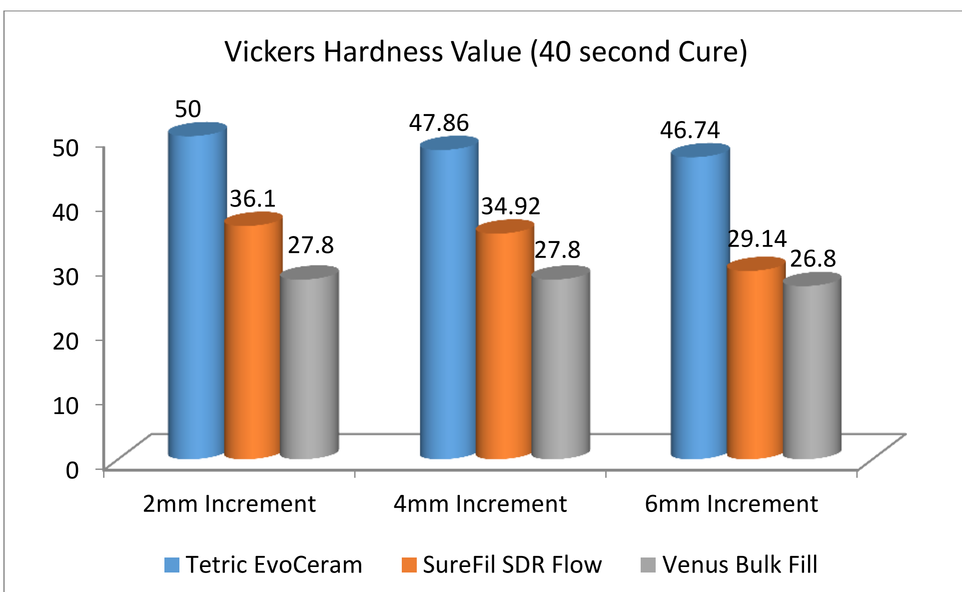
Curing Duration vs Depth of Cure and Modulus of Bulk-Fill-Composites

S. Zawawi, N. Brulat, and D. Nathanson. IADR 2012, Abstract#121 [54]

OBJECTIVE: To evaluate the effect of curing duration on depth of cure and elastic modulus of "Bulk-Fill" Flowable composites: Tetric EvoCeram (IvoclarVivadent); Surefil SDR (Dentsply) and Venus Bulk Fill (Heraeus).

RESULTS:





CONCLUSION: There is a significant difference in modulus among the tested materials (p=0.5). Photocuring duration and type of material has significant effect on the depth of cure and modulus of elasticity. (p= 0.05). At a 6mm depth the composites achieved a 78% - 96% level of curing vs. 2mm depth. This study confirms the deep curing properties of SureFil SDR Flow.

Curing mode and duration effect on polymerization of bulk-fill composites

Zawawi S, Brulat N, and Nathanson D. IADR 2012, Abstract#515 [55]

OBJECTIVE:

To investigate the effect of curing durations and high vs "soft start"modes on the depth of cure of Bulk-Fill Flowable composites. The following Bulk-Fill materials were included: TetricEvoCeram (Ivoclar Vivadent); Surefil SDR flow (Dentsply); Venus (Heraeus Dental).

RESULTS:

% Photocuring on Top layer in High Mode (HM) and Soft Start (SS) curing mode

Depth	2 mm				4 mm				6 mm			
Duration	10s		40s		10s		40s		10s		40s	
Mode	HM	SS	HM	SS	HM	SS	HM	SS	HM	SS	HM	SS
Tetric EvoCeram	105%	99%	95%	102%	93%	95%	92%	98%	83%	99%	94%	107%
Surefil SDR flow	100%	106%	104%	102%	91%	98%	106%	99%	79%	83%	95%	82%
Venus	119%	106%	110%	103%	124%	103%	116%	103%	113%	99%	114%	107%

CONCLUSION:

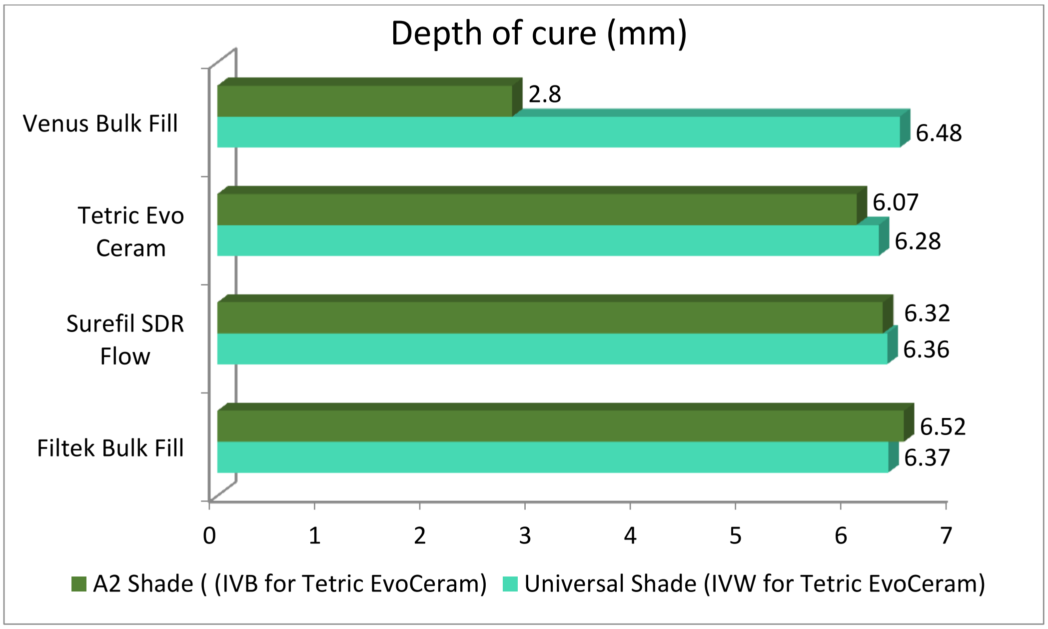
There was a significant difference between curing with high and "soft-start" mode (p= 0.05). TetricEvoCeram Bulk, was significantly different at 10s with the "soft-start" mode. Whereas, Surefil SDR and Venus were significantly different at 40s with high mode of curing. Photocuring duration and type of material has significant effect on the depth of cure (p= 0.05). All composites tested, which includes SureFil SDR Flow, are capable of curing to a depth of 6 mm.

Depth of Cure of Different Shades of Bulk Fill Composites

H. Kunduru, M. Finkelman, E.H. Doherty, M. Harsono, and G. Kugel. IADR 2013, Abstract#2437 [56]

OBJECTIVE: To evaluate the depth of cure of bulk fill composite materials using the scraping method. Four bulk fill composite materials (Filtek, Surefil SDR, Tetric Evo Ceram and Venus) were tested in two different shades (except Venus).

RESULTS:



CONCLUSION: All seven composites cured well beyond the manufacturers recommended curing depths of 4 mm or 5 mm.

This study reinforces that SureFil SDR Flow provides consistently high curing depths which helps reduce the number of steps in composite placement.

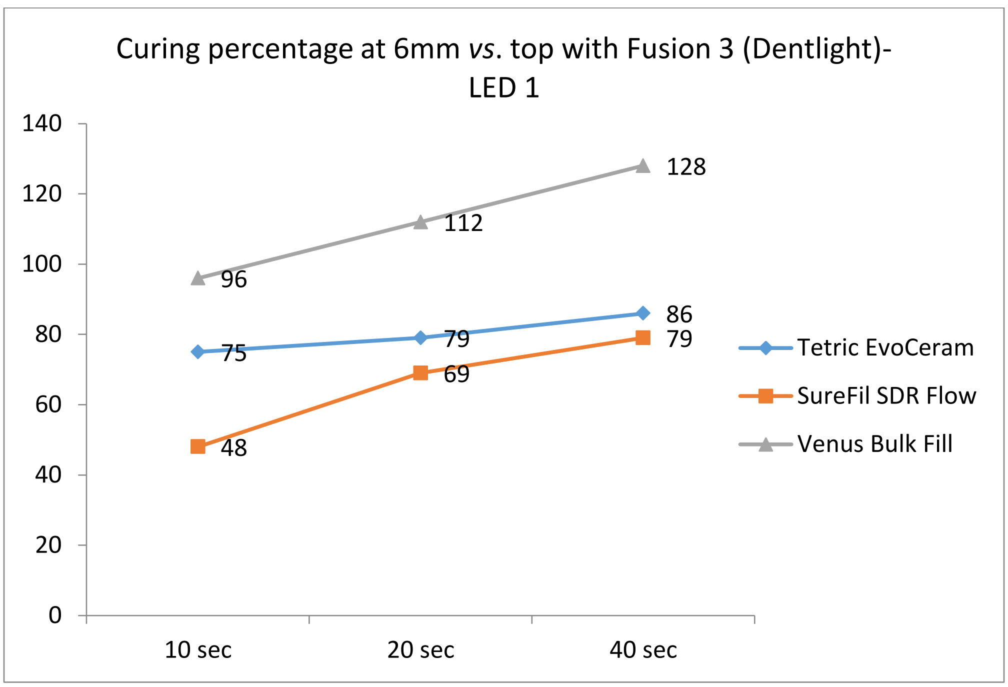
Effect of LED Curing Units on Properties of Bulk-Fill Composites

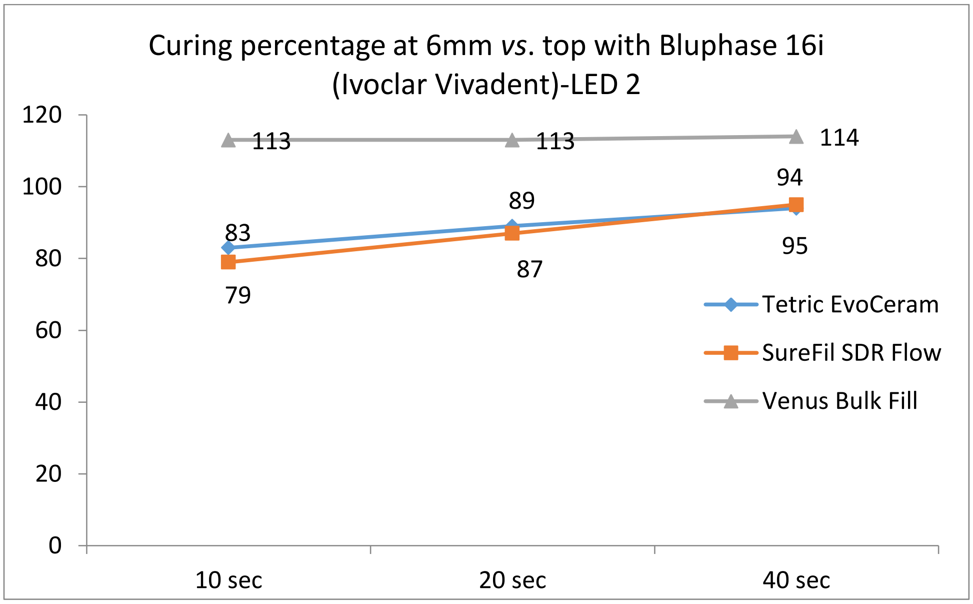
N. Brulat-Bouchard, S. Zawawi, and D. Nathanson. IADR 2012, Abstract#516 [57]

OBJECTIVE: To evaluate the effect of curing lights and curing duration on depth of cure and elastic modulus of “Bulk-Fill”composites.

The Fusion 3 (Dentlight) (LED 1) and Bluphase 16i (Ivoclar Vivadent)(LED 2) photocuring units were used for 10, 20 and 40 seconds.

RESULTS:





CONCLUSIONS:

Photocuring duration, curing light, and material have significant effect on depth of cure. At 6mm depth with LED 2 the composites achieved a 79%-114% level of curing vs. top, confirming deep curing properties, but not with the LED 1. Photocuring for 40s had a significant effect on producing a higher modulus vs. 10s and composite Tetric EvoCeram had a significant higher elastic modulus than SureFil SDR Flow and Venus Bulk Fill under all curing conditions (p=0.05).

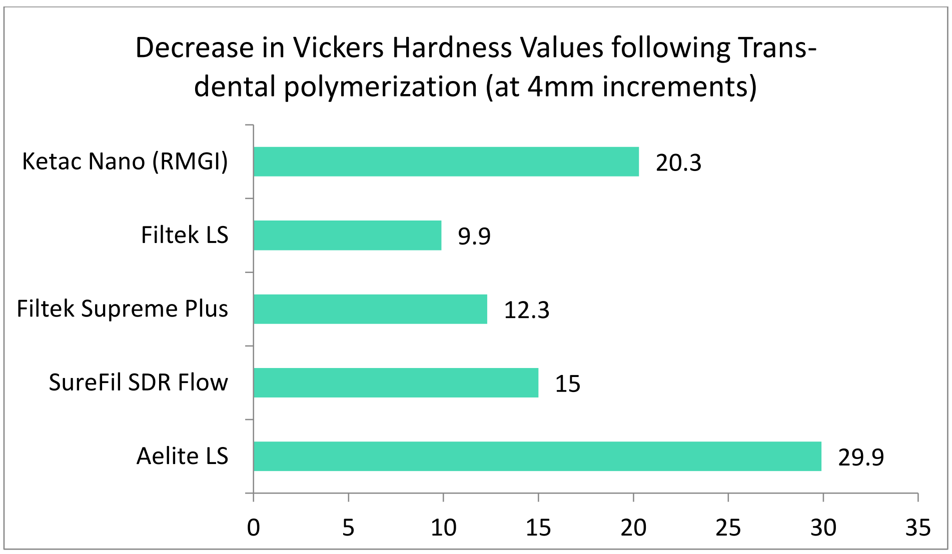
SureFil SDR flow is more effectively cured by Bluephase 16i LED curing light than Fusion 3.

The effect of trans-dental light-polymerization on low-shrinkage and flowable composites

L. Dalmagro Peruchi, C.S. Boyko, N. Sartori, J. Phark, and S. Duarte. IADR 2011, Abstract#588
58

OBJECTIVE: To evaluate the effect of trans-dental light-polymerization on Vickers Hardness (VH) of low-shrinkage, flowable, and conventional resin composites, and nanofilled resin-modified glass-ionomer (RMGI). Materials tested include: Low-shrinkage resin composites: Aelite LS, Bisco (ALS), Filtek LS, 3M ESPE (FLS); flowable composites: Filtek Supreme Plus flowable, 3M ESPE (FSP), SureFil SDR, Dentsply (SRD); microhybrid composite: TPH, Dentsply (TPH), and nanofilled RMGI [Ketak Nano, 3M ESPE (KTN)]

Results: Significant differences were observed among the experimental groups (P<.0001). Direct light-polymerization yielded the highest VH at 0mm [ALS (74.3±4.6)>FLS (48.6±0.7)>TPH (47.8±2.5)>FSP (29.5±3.1)>KTN(29.3±5.3)>SDR(25.7±3.5)].



CONCLUSION: Trans-dental light-polymerization decreases polymerization depth of low-shrinkage and flowable composites.

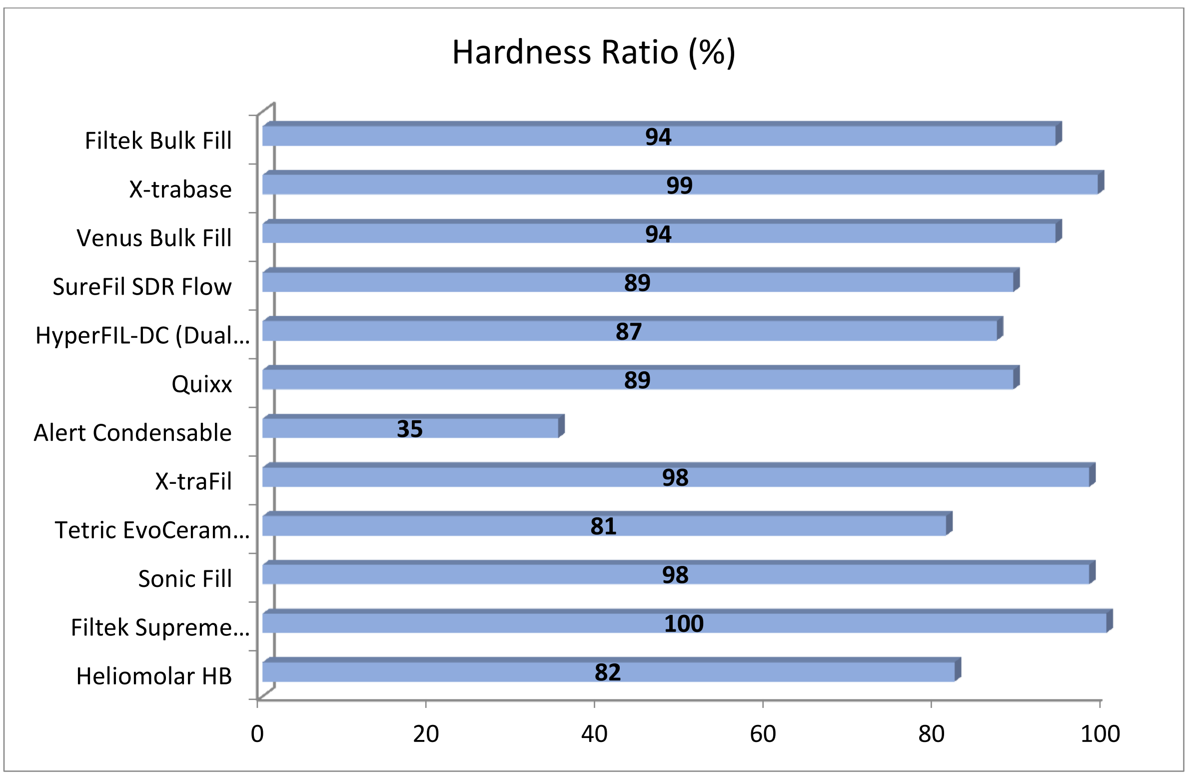
Examining the Depth of Cure for Bulk Fill Composite Materials

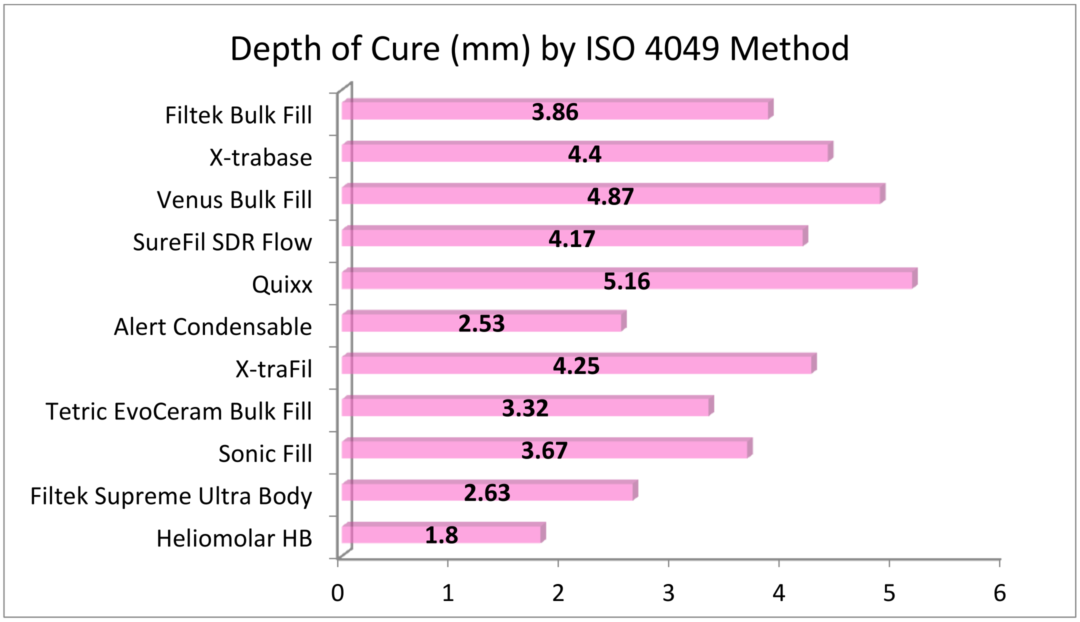
A. Tiba, A. Hong, and G. Zeller. IADR 2013, Abstract#2435 [59]

OBJECTIVE: To measure the depth of cure by ISO 4049 versus microhardness of bulk fill composite resins.

RESULTS:

The hardness ratio was calculated (%H = Hbottom/Htop x 100). 80% represents a bottom to top degree of cure of 90% and is considered to be adequate curing.





CONCLUSION: Sonic Fill, Tetric EvoCeram Bulk Fill, and Alert Condensable did not pass ISO4049 (DOC shall be no more than 0.5mm below the value stated by the manufacturer); however, all materials, including SureFil SDR Flow, passed the hardness test. This study shows some limitations of ISO 4049 for testing the depth of cure in relation to the more important hardness ratio for bulk fill composite materials.

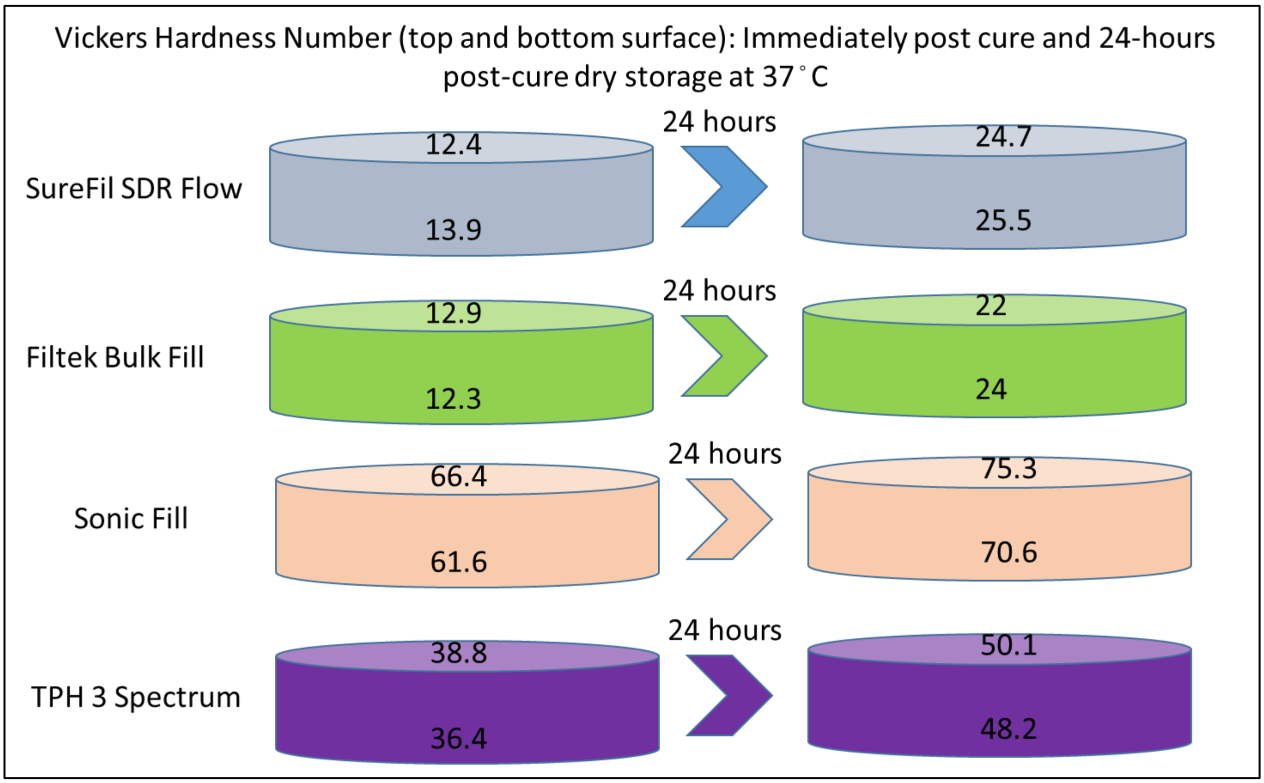
D. PHYSICAL PROPERTIES

Post-irradiation hardness development, chemical softening, and thermal stability of bulk-fill and conventional resin-composites.

Alshali RZ, Salim NA, Satterthwaite JD, Silikas N. J Dent. 2015 Feb; 43(2):209-18.[60]

OBJECTIVE: To measure bottom/top hardness ratio of bulk-fill and conventional resin-composite materials, and to assess hardness changes after dry and ethanol storage.

RESULTS:



CONLCUSION:

SureFil SDR Flow showed a significant (100%) increase of microhardness after 24h of dry storage. Bulk-fill resin-composites exhibit comparable bottom/top hardness ratio to conventional materials at recommended manufacturer thickness.

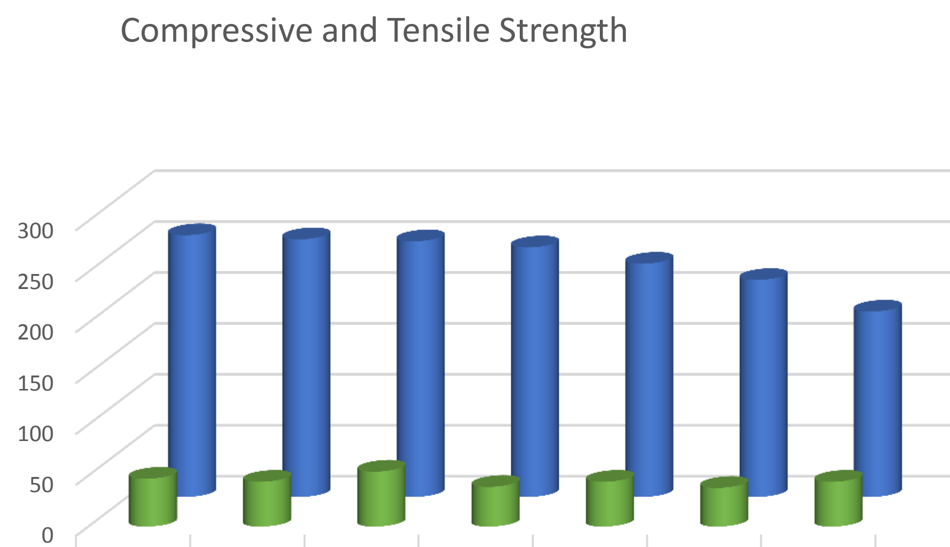
Mechanical Properties and Cusp Deflection of Bulk Fill Composite Resins

Soares CJ, Carvalho VF, Rosatto CM, Bicalho AA, Ferreira MS, Tantbirojn DV, Versluis A.

IADR 2015, Abstract # 2193[61]

OBJECTIVE: The aim of this study was to evaluate diametral tensile strength, compression strength and cuspal deformation of bulk fill composite resins

RESULTS:



	Z350	Esthet-X HD	Charisma Diamond	Filtek Bulk Fill	Venus Bulk Fill	Tetric Bulk Fill	SureFil SDR Flow
Tensile Strength (MPa)	47	44	54	39	44	38	44
Compressive Strength (MPa)	257	253	251	245	229	213	182

CONCLUSION: SureFil SDR Flow had lower compressive strength than universal composite resins. The bulk fill composites generally had lower tensile strength than universal composite resins. No difference was found for cusp deflection among composite resins tested.

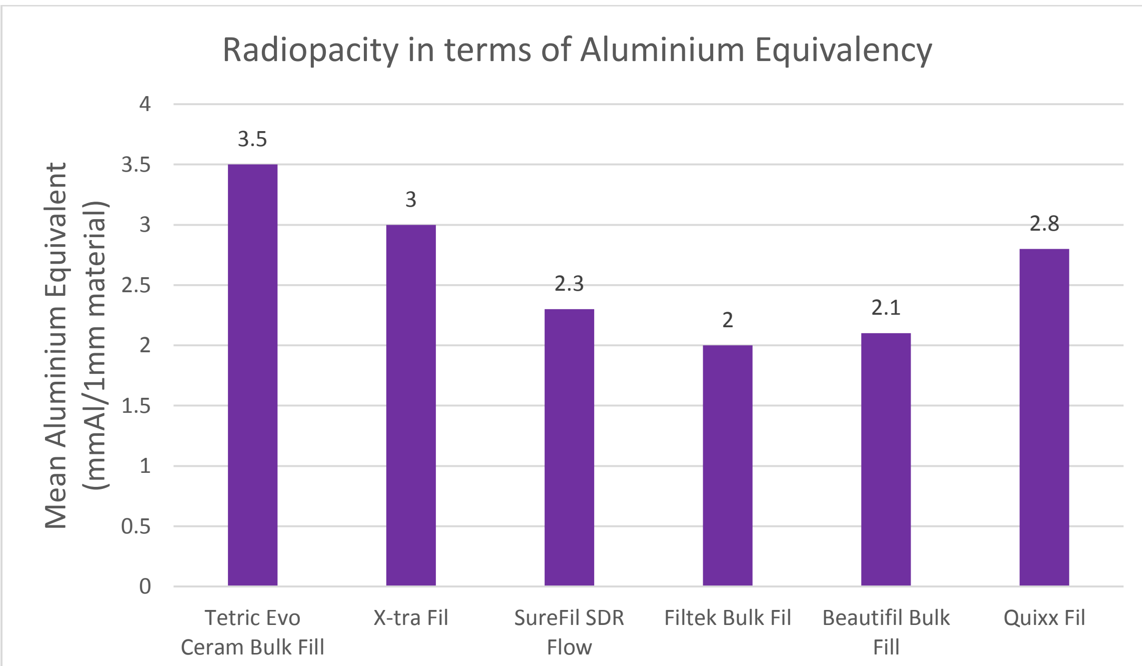
Radiopacity of a group of bulk-fill composite restoratives

Deif M, Dagher A, El-Badrawy W, El-Hadary A, Kandil M, Hosney S.

IADR 2015,Abstract #2209[62]

OBJECTIVE: This study determined the radiopacity of different bulk-fill composites using digital radiography.

RESULTS:



CONCLUSION: All tested composite restorative materials showed radiopacity values higher than that of dentin which met the ISO Standard recommendation

An in-vitro assessment of the shear bond strength of bulk-fill resin composites to permanent and deciduous teeth.

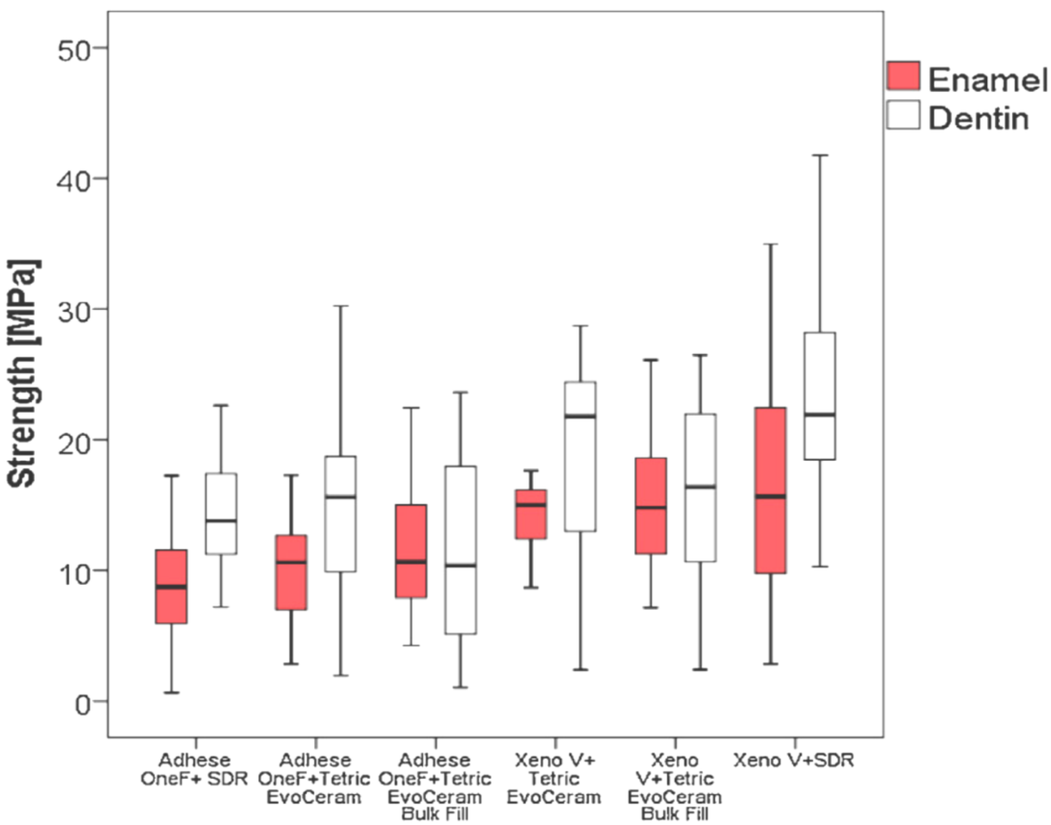
Ilie N, Schoner C, Bucher K, Hickel R. J Dent 2014.[63]

OBJECTIVE: This study aimed to evaluate the shear bond strength (SBS) of bulk-fill resin composites (RCs) to deciduous and permanent teeth.

The bulk-fill RCs (Tetric Evo Ceram Bulk Fill and SureFil SDR) were applied in one 4-mm increment, whereas the regular RC (Tetric Evo Ceram) was layered in two consecutive 2-mm increments.

RESULTS: The parameter tooth type (permanent or deciduous) showed no significant impact on the SBS ($p=0.576$). The influence of the other parameters was significant ($p<0.05$) but low, and the highest influence was exerted by the parameter adhesive ($\eta(P)(2)=0.120$, $p=0.0001$) followed by tooth substrate ($\eta(P)(2)=0.092$, $p=0.0001$) and restorative material ($\eta(P)(2)=0.028$, $p=0.0001$). The fracture pattern was predominantly adhesive (61.9%) or mixed (38.1), and no cohesive or prefailure was registered.

Shear Bond Strength as a function of substrate (Enamel or Dentin) in Permanent teeth



CONCLUSIONS: Bulk-fill materials(SureFil SDR Flow and Tetric EvoCeram Bulk Fill) performed comparable or better than the nanohybrid RC used as control (Tetric Evo Ceram), but the adhesive used was the most relevant factor of influence. This study agrees that SureFil SDR Flow might be clinically an option for a faster restoration in both permanent and deciduous teeth.

Post-retentive ability of new flowable resin composites.

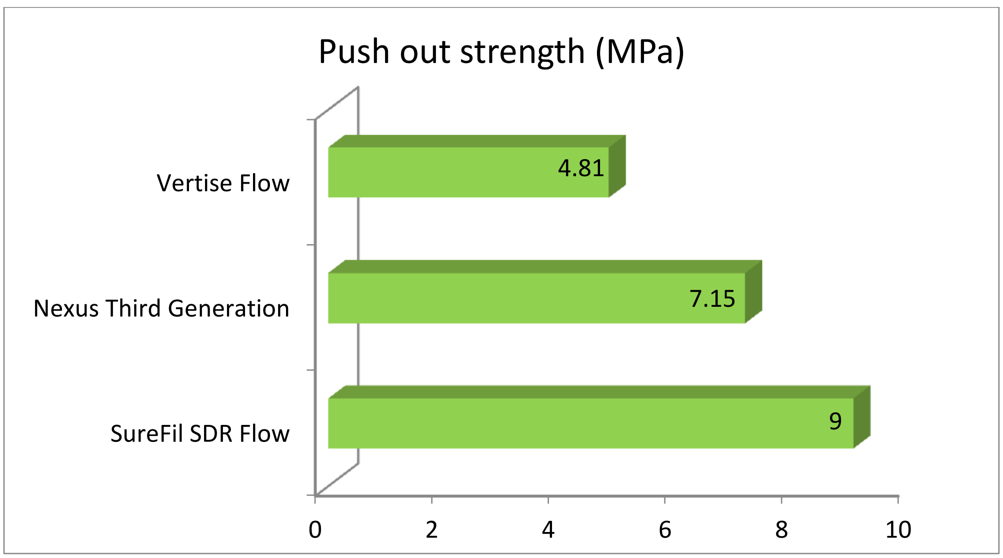
Juloski J, Goracci C, Radovic I, et al. Am J Dent 2013;26(6):324-8[64]

OBJECTIVE: To investigate the applicability of flowable composites as post luting agents by assessing the push-out strength of posts.

The following combinations of adhesive/cement were tested: OptiBond Solo Plus/Nexus Third Generation (NX3), XP Bond/SureFil SDR Flow (SDR), and Vertise Flow (VF).

RESULTS:

The statistical analysis revealed that only the type of luting material significantly influenced push-out bond strength of the post (P< 0.001). SDR (9.00 +/- 2.17 MPa) performed similarly to the control group NX3 (7.15 +/- 1.74 MPa), while VF (4.81 +/- 1.51 MPa) should significantly lower bond strength. Failure modes differed significantly among groups.



CONCLUSION:

SureFil SDR Flow and Nexus Third Generation have higher post-retentive ability than Vertise Flow.

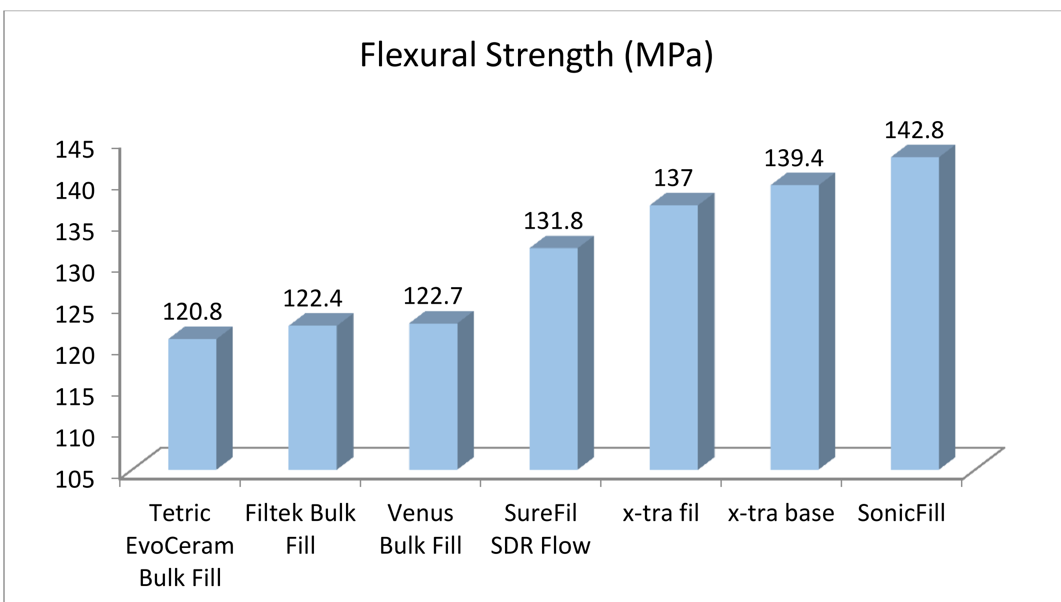
Bulk-fill resin-based composites: an in vitro assessment of their mechanical performance.

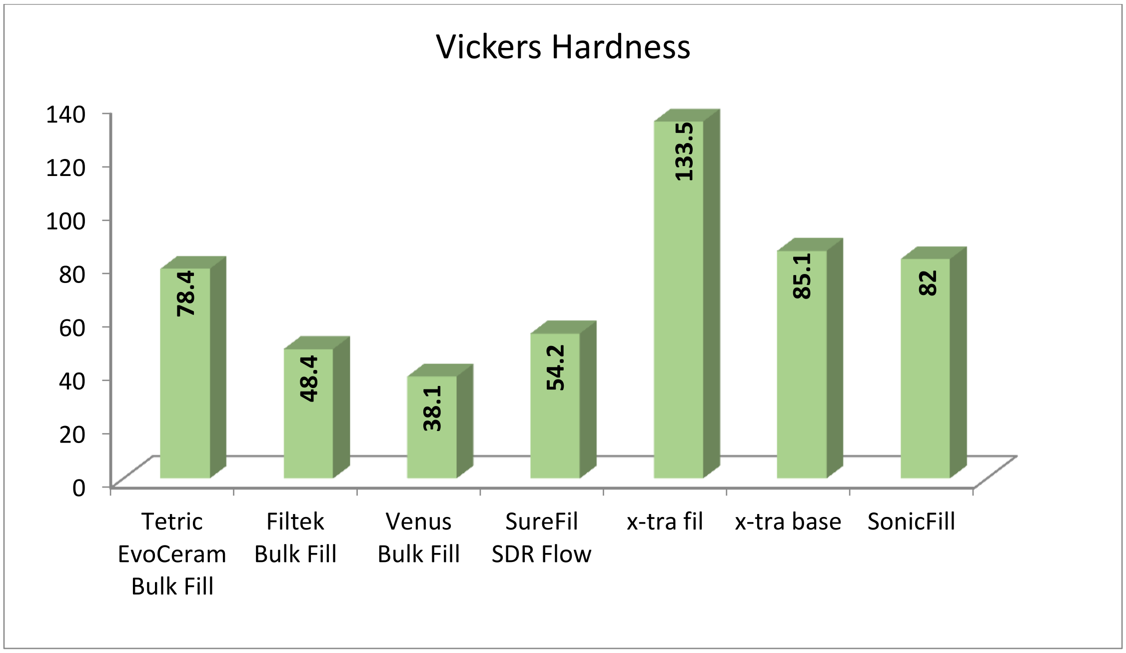
Ilie N, Bucuta S, Draenert M. Oper Dent 2013;38(6):618-25. [65]

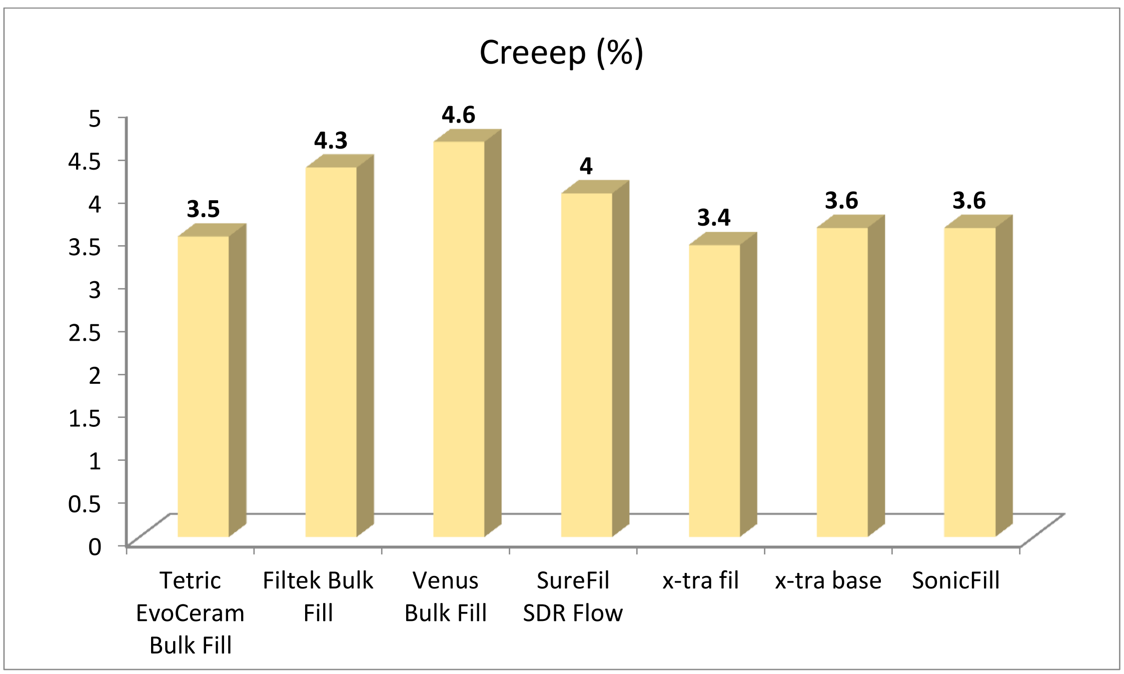
IADR 2013, Abstract#2442 [66]

OBJECTIVE: The study aimed to assess the mechanical performance of seven bulk-fill RBCs (Venus Bulk Fill, Heraeus Kulzer; SureFil SDR flow, Dentsply Caulk; x-tra base and x-tra fil, VOCO; Filtek Bulk Fill, 3M ESPE; SonicFill, Kerr; Tetric EvoCeram Bulk Fill, Ivoclar Vivadent) by determining their flexural strength (σ), reliability (Weibull parameter, m), flexural modulus (Eflexural), indentation modulus (YHU), Vickers hardness (HV), and creep (Cr).

RESULTS: The significant highest flexural strengths were measured for SonicFill, x-tra base, and x-tra fil; while x-tra base, SureFil SDR flow, and Venus Bulk Fill showed the best reliability. The differences among the materials became more evident in terms of Eflexural and YHU, with x-tra fil achieving the highest values, while Filtek Bulk Fill and Venus Bulk Fill achieved the lowest. The enlarged depth of cure in bulk-fill RBCs seems to have been realized by enhancing the materials' translucency through decreasing the filler amount and increasing the filler size. The class of bulk-fill RBCs revealed similar flexural strength values as the class of nanohybrid and microhybrid RBCs, and significantly higher values when compared to flowable RBCs. The modulus of elasticity (Eflexural), the indentation modulus (YHU), and the Vickers hardness (HV) classify the bulk-fill RBCs as between the hybrid RBCs and the flowable RBCs; in terms of creep, bulk-fill and the flowable RBCs perform similarly, both showing a significantly lower creep resistance when compared to the nanohybrid and microhybrid RBCs.







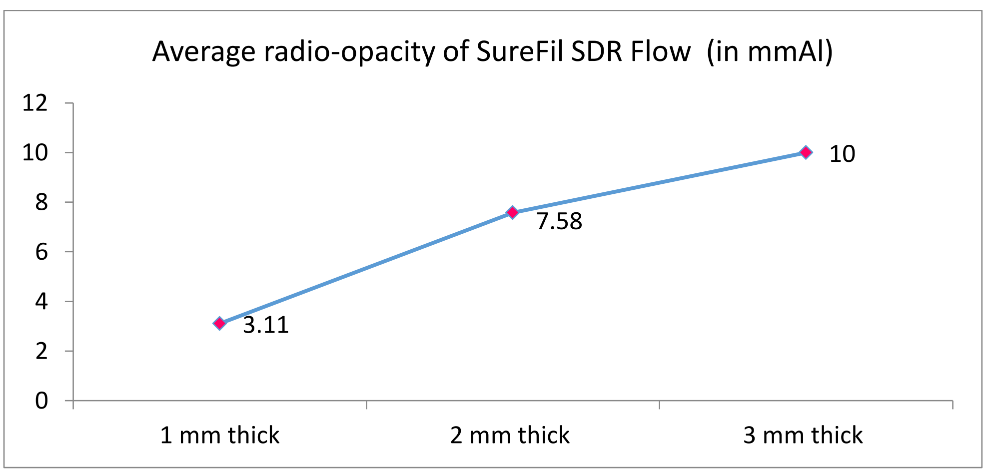
CONLCUSION: The manufacturer's recommendation to finish a bulk-fill RBC restoration by adding a capping layer made of regular RBCs is an imperative necessity, since the modulus of elasticity and hardness of certain materials (SureFil SDR flow, Venus Bulk Fill, and Filtek Bulk Fill) were considerably below the mean values measured in regular nanohybrid and microhybrid RBCs.

Study of the radio-opacity of base and liner dental materials using a digital radiography system.

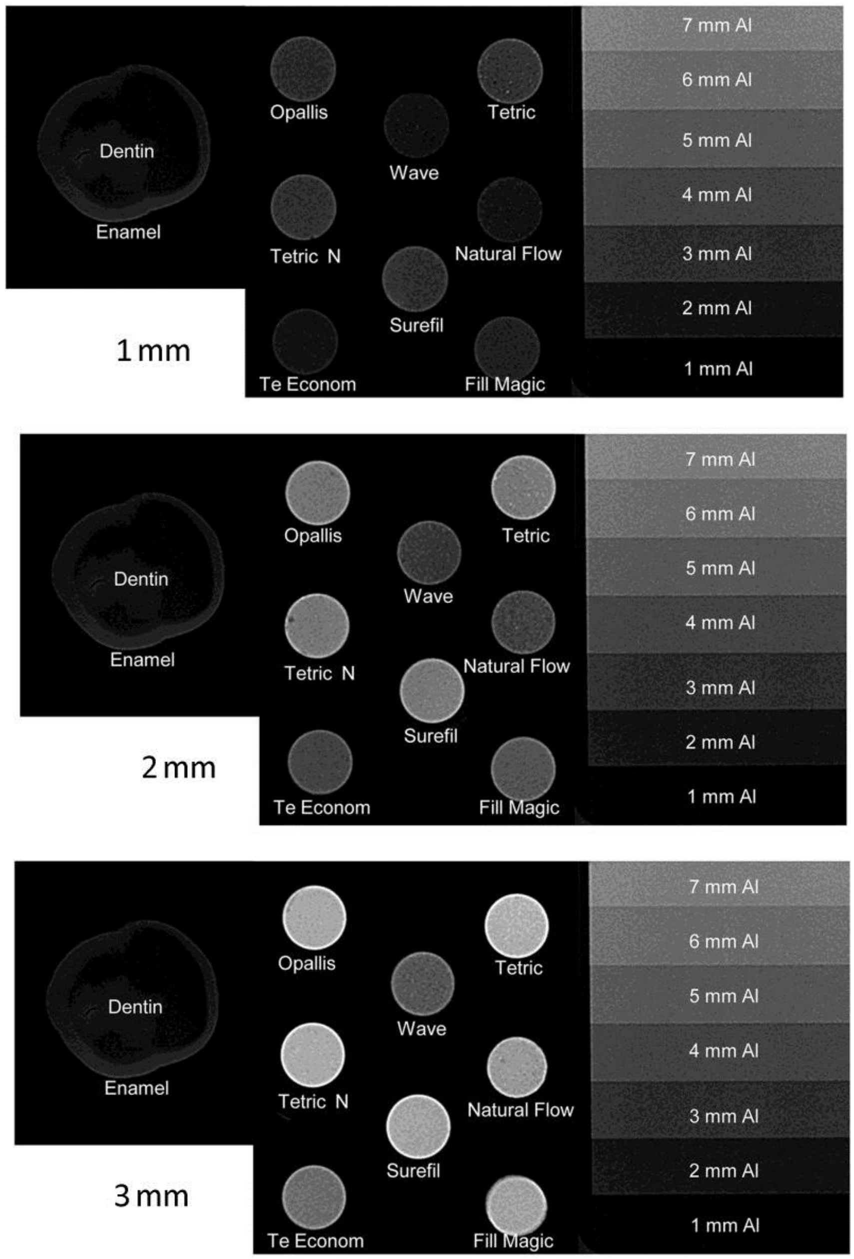
Lachowski KM1, Botta SB, Lascala CA, Matos AB, Sobral MA. Dentomaxillofac Radiol. 2013;42(2):20120153.[67]

OBJECTIVE: This study investigated the radio-opacity of commercially available glass ionomer cements (GICs), flowable resin composites (FRCs) and calcium hydroxide cements (CHCs) and compared this with the radio-opacity of enamel, dentine and aluminium stepwedge. 16 GICs, 8 FRCs and 4 CHCs were analysed at different thicknesses.

RESULTS: The GICs Ionomaster (Wilcos, Petrópolis, Brazil), Maxxion (FGM, Joinville, Brazil), Bioglass R (Biodinâmica, Ibiporã, Brazil), Bioglass F (Biodinâmica), Vidrion R (SS White, Rio de Janerio, Brazil) and Vidrion F (SS White), presented radio-opacity lower than that of dentine. All FRCs and CHCs studied showed radio-opacity higher than that of dentine. Vitro Fil (DFL, Rio de Janeiro, Brazil), Magic Glass (Vigodent, Rio de Janeiro, Brazil), Vitrebond (3M, Sumaré SP, Brazil), Riva Self Cure (SDI, Victoria, Australia), Riva Light Cure (SDI), Fill Magic (Vigodent), Opallis (FGM, Joinville, Brazil), Surefil SDR (Dentsply, Milford, DE), Tetric N (Ivoclar Vivadent, Schaan, Lichtenstein), Tetric (Ivoclar Vivadent), Hydro C (Dentsply, Petrópolis, Brazil), Hydcal (Technew, Madalena, Portugal) and Liner (Vigodent) showed radio-opacity similar to or greater than that of enamel for all thicknesses.



Radiographic images of flowable resin composites, enamel, dentine and aluminium for 1 mm, 2 mm and 3 mm



CONCLUSIONS:

The increased thickness of the materials studied increases their radio-opacity. Some commercially available GICs used as a base and liner for restorations have a very low radio-opacity (Ionomaster, Maxxion, Bioglass R, Bioglass F, Vidrion R and Vidrion F).

Nanomechanical properties of dental resin-composites.

El-Safty S, Akhtar R, Silikas N, Watts DC. Dent Mater. 2012 Dec;28(12):1292-300.[68]

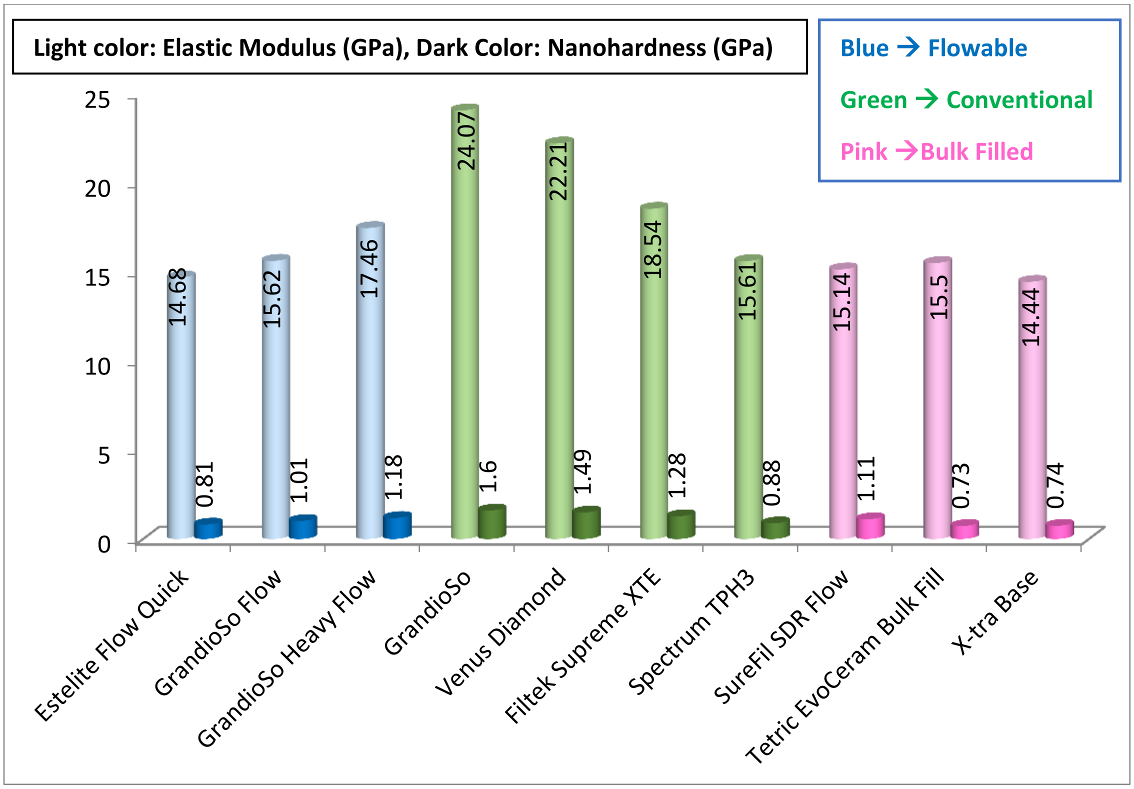
OBJECTIVE: To determine by nanoindentation the hardness and elastic modulus of resin-composites, including a series with systematically varied filler loading, plus other representative materials that fall into the categories of flowable, bulk-fill and conventional nano-hybrid types.

Ten dental resin-composites: three flowable, three bulk-fill and four conventional were investigated using nanoindentation.

RESULTS:

Dependent on the type of the resin-composite material, the mean values ranged from 0.73GPa to 1.60GPa for nanohardness and from 14.44GPa to 24.07GPa for elastic modulus. There was a significant positive non-linear correlation between elastic modulus and nanohardness (r(2)=0.88). Nonlinear regression revealed a significant positive correlation (r(2)=0.62) between elastic moduli and filler loading and a non-significant correlation (r(2)=0.50) between nanohardness and filler loading of the studied materials. Varying the unloading rates showed no consistent effect on the elastic modulus and nanohardness of the studied materials.

Physical Properties



CONCLUSION:

For a specific resin matrix, both elastic moduli and nanohardness correlated positively with filler loading. For the resin-composites investigated, the group-average elastic moduli and nanohardnesses for bulk-fill and flowable materials were lower than those for conventional nano-hybrid composites.

The results of this study are consistent with SureFil SDR Flow's instructions for use, which require a capping agent.

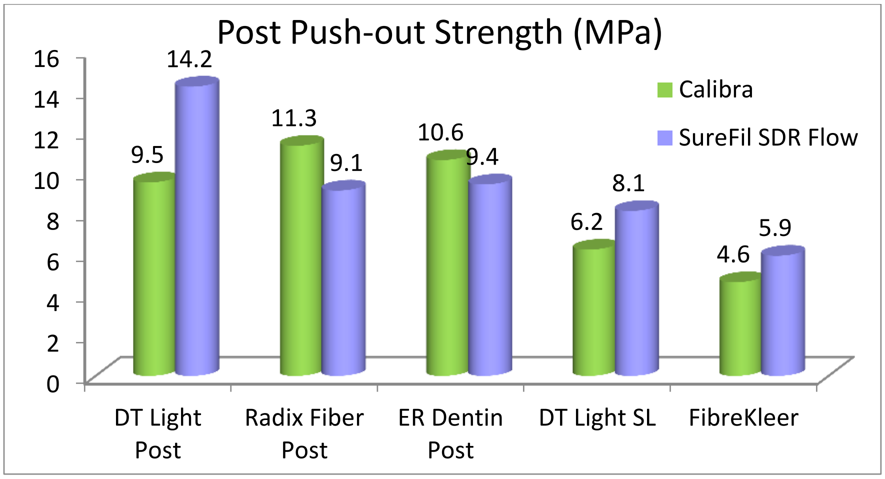
Post retentive ability of a new resin composite with low stress behaviour.

Giovannetti A, Goracci C, Vichi A, Chieffi N, Polimeni A, Ferrari M. J Dent. 2012 Apr;40(4):322-8. [69]

OBJECTIVE: To assess by means of push-out test the post retentive potential of a new flowable resin composite with low polymerization stress, SureFil SDR Flow.

RESULTS:

Cement type did not have a significant effect on post retention (p=0.54). Post type was a significant factor for push-out strength (p<0.001). DT Light Post exhibited significantly higher retentive strength than DT Light SL and FibreKleer; push-out strengths of ER Dentin Post and Radix Fiber Post were significantly higher than those of FibreKleer. Post retention was significantly influenced by post space level (p<0.001). Significantly higher push-out strengths were recorded at the coronal third than at the middle and apical levels. The post-cement interaction was significant (p=0.002). Posts luted with SureFil SDR Flow most often failed at the cement-post interface.



CONCLUSION:

SureFil SDR Flow, a flowable composite originally proposed for bulk filling of posterior restorations, exhibited post retentive strengths similar to those of a cement by the same manufacturer. With a relatively high filler load, yet a low curing stress, SureFil SDR Flow may be adequate for both post cementation and core build-up.

Surface morphology and mechanical properties of new-generation flowable resin composites for dental restoration.

Salerno M, Derchi G, Thorat S, Ceseracciu L, Ruffilli R, Barone AC. Dent Mater. 2011 Dec;27(12):1221-8.[70]

OBJECTIVE: The purpose of this study was to characterize the surface morphology and the elastic properties of four dental restorative flowable composites currently on the market (Venus Diamond Flow, Vertise Flow, Filtex Supreme XT Flow, Surefil SDR Flow). Additionally, one adhesive system (Adhese One F) and one non-flowable composite (Venus Diamond) have also been characterized as the control materials.

RESULTS:

It was observed that Vertise, Filtek XT and Surefil SDR exhibit stiffness similar to the non-flowable Venus Diamond, whereas Venus Diamond Flow presents itself as the more compliant flowable composite, with Adhese showing intermediate stiffness. Grain analysis of the images confirmed the general rule that the mechanical properties improve with increasing filler loading, with the notable exception of Vertise Flow that shows modulus and hardness as high as 9.1±0.6 and 0.43±0.03GPa, respectively, for an estimated loading of only ~40% by volume.

CONCLUSION:

Whereas generally flowable composites are confirmed not to possess sufficiently strong mechanical properties for bulk restorations, exceptions can eventually be found upon appropriate laboratory screening, as presently seems to be the case for Vertise Flow. However, real practice in actual restorations and respective clinical evaluation are required for final assessment of the suggested results

Wear of a dental composite in an artificial oral environment: A clinical correlation.

DeLong R, Pintado MR, Douglas WH, Fok AS, Wilder AD Jr, Swift EJ Jr, Bayne SC. J Biomed Mater Res B Appl Biomater. 2012 Nov;100(8):2297-306.[71]

OBJECTIVE:

The study objective was to correlate wear between an in vitro method for simulating wear and in vivo wear of a posterior dental composite. The wear of SureFil composite (Caulk, Dentsply) was assessed.

RESULTS:

Clinical restorations included contact wear on seven restorations and contact-free wear on all restorations. Contact-free wear was less than contact wear (p < 0.01). SureFil clinical wear rates were 0.012 mm/year (mean depth) and 0.023 mm(3)/year (volume). Clinical restorations expanded slightly during the first year. Using a conversion rate of one year equals 3 × 10(5) cycles, there were no significant differences between the clinical and simulated data except depths at Year 5 and 13 N volume at Year 4. The 30 N simulation reproduced the clinical data if contact-free wear was taken into account.

CONCLUSION:

Good agreement between simulated and clinical wear implies that in vitro simulation can screen new composite formulations.

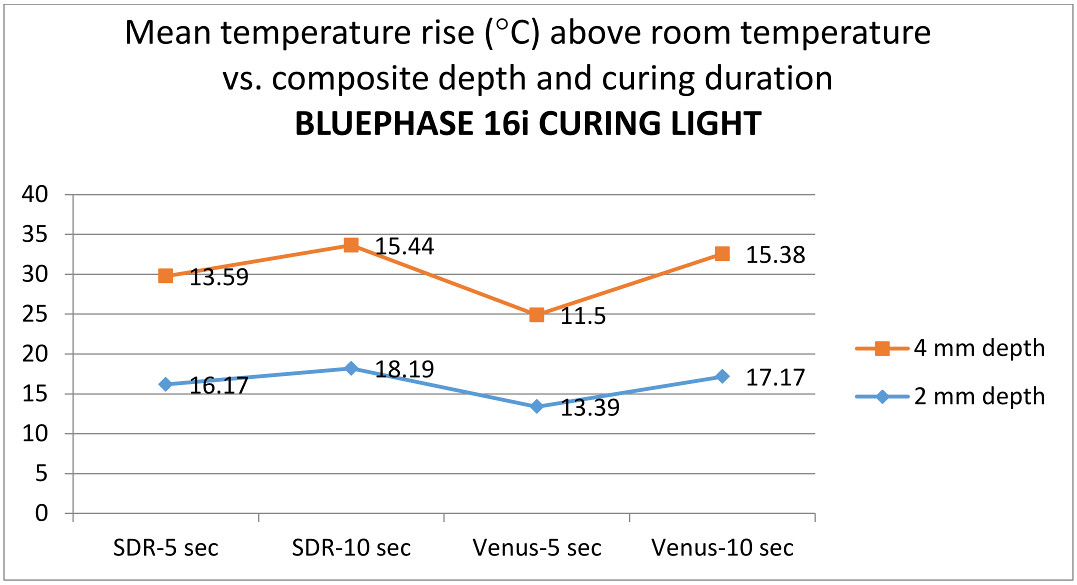
Temperature rise during photocuring of bulk-fill composites

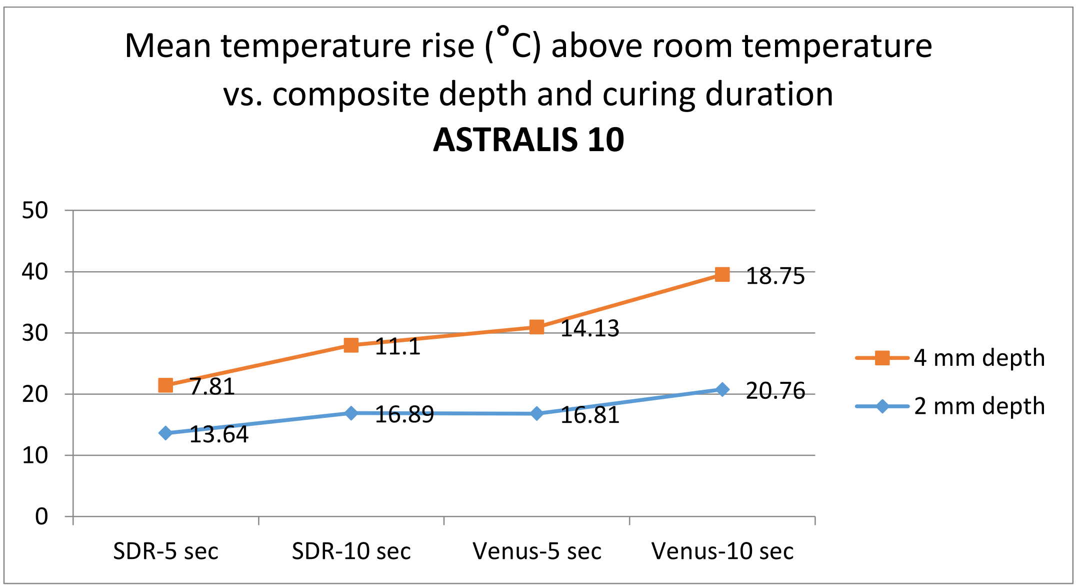
S. Zawawi, R. Pober, and D. Nathanson. AADR 2014, Abstract#8 [72]

OBJECTIVE: To evaluate the effect of light curing on temperature change during polymerizing bulk-Fill composites. Two Bulk-Fill materials were included in this study: Surefil SDR Flow (DENTSPLY); Venus Bulk Fill (Heraeus). Light curing devices: LED Bluephase 16i (Ivoclar) on high intensity mode and Halogen light Astralis 10 (Ivoclar).

RESULTS:

Physical Properties





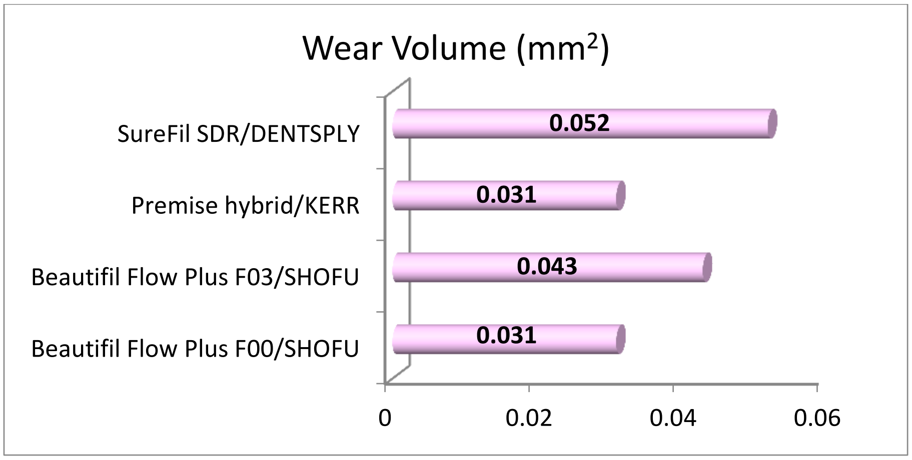
CONCLUSION: The temperature change upon polymerizingSurefil SDR Flow and Venus Bulk Fill did not exceed the accepted limit of 5.5 °C above body temperature. Furthermore, light curing the assigned Bulk Fill Composites for 10 seconds resulted in a significantly higher temperature change than 5 seconds for both light curing units ($p<0.05$).

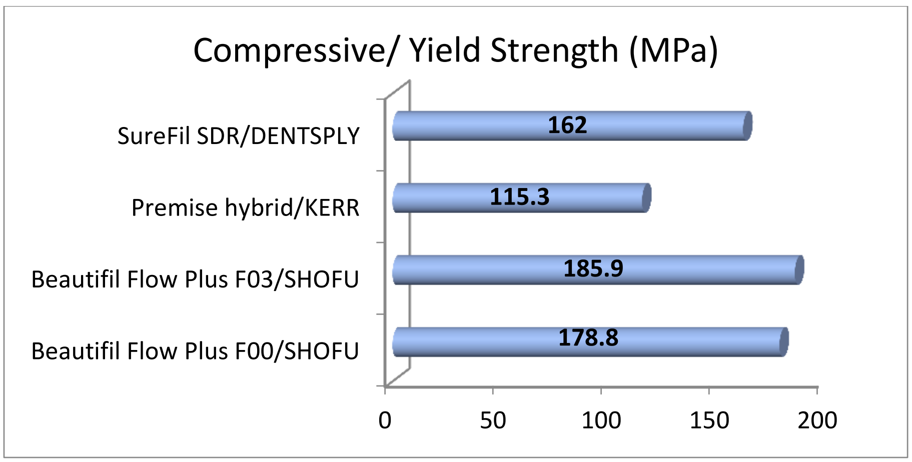
Mechanical Properties of Flowable Composite Resins and a Giomer

V.K. Kalavacharla, R. Robles, Q. Cai, D. Cakir, P. Beck, L. Ramp, and J. Burgess. AADR 2012, Abstract#847 [73]

OBJECTIVES: To measure and compare compressive strength, yield strength and wear resistance of a giomer, BEAUTIFIL Flow Plus, to flowable composite resins, PREMISE hybrid and SureFil SDR flowable.

RESULTS:





CONCLUSIONS: Within the limitations of this study, Beautifil Flow Plus F03 and F00 showed similar compressive strength, yield strength and wear with commercially available flowable composites. They also showed similar wear properties with Hybrid material.

Evaluation of a fibre reinforced composite properties for bulk filling

H. Abouelleil, T. Munhoz, C. Villat, P. Colon, B. Grosgogeat, and N. Pradelle-Plasse. IADR 2013, Abstract#207 [74]

OBJECTIVE:

The potential for improved mechanical properties in a newly developed composite with fibres as the dispersed phase was evaluated. EverX Posterior™ - EXP - GC and other commercially available bulk fill composites (Filtek™ Bulk Fill- FBF - 3M, SonicFill ™- SF - Kerr, SureFil® SDR® -

SDR - Dentsply, Venus® Bulk Fill- VBF - Heraeus Kulzer and Xtra Base - XB - VOCO) were characterized.

RESULTS:

SEM shows well dispersed fibres working as a reinforcing phase. ANOVA shows that the mechanical properties of the materials are statistically different among them. EXP, SF and XB were not statistically different in terms of flexural strength. Moreover, tested composite bars broke apart, in contrast to EXP samples, which remained attached. EXP calculated KIC (2,55 ± 0,64) rests in the same order of the other composites studied, with EXP, FBF and VBF presenting no statistically significant differences. All the materials tested showed a decrease in hardness from the surface to the bulk and an increase of 10-50% between hardness values of recently cured and 24h aged samples.

CONCLUSION:

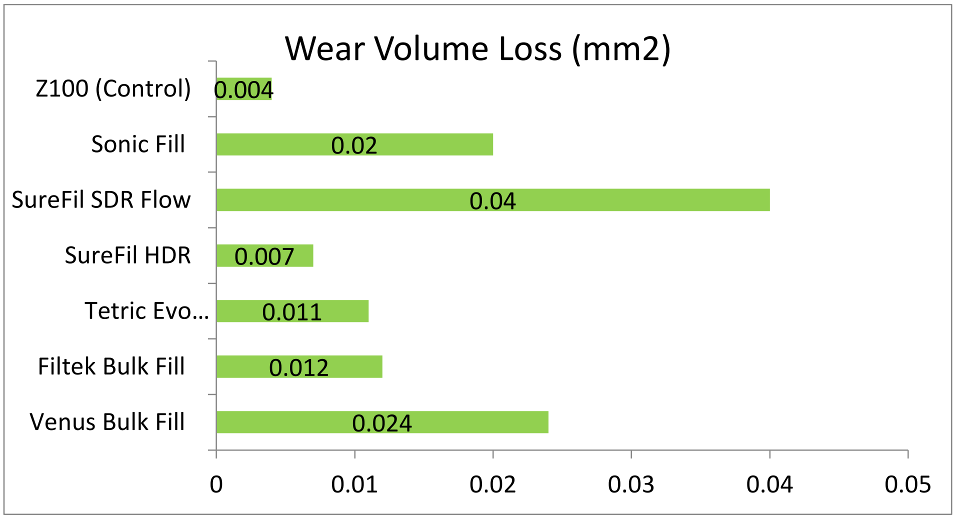
The addition of fibres to a methacrylate based matrix result in composites with either comparable or superior mechanical properties compared to the other bulk fill materials tested.

In Vitro Wear of Eight Bulk Placed and Cured Composites

K. Sawlani, P. Beck, L.C. Ramp, D. Cakir-Ustun, and J. Burgess. IADR 2013, Abstract#2441. [75]

OBJECTIVE: To determine and compare in vitro three-body wear of 8 commercially available bulk placed composites.

RESULTS: Z100 produced the least amount of wear whereas SureFil SDR Flow produced the highest compared to rest of the materials (p<.0001).



CONCLUSION: Since wear differs significantly between materials, it should be a factor in the selection of bulk filled composite resins. Materials such as SureFil SDR Flow that do not have high wear resistance should be covered with a wear resistant composite, which complies with the manufacturer instructions.

Edge strength of bulk-fill and conventional resin-composites

N. Silikas, M. Zankuli, and D. Watts. IADR 2012, Abstract#514 [76]

OBJECTIVE: To compare the edge strength of several bulk-fill materials with traditional resin-composites.

The following materials were tested: X-tra base, Venus Bulk Fill, SureFil SDR, (bulk-fill composites), and GrandioSO, Venus Diamond and Spectrum TPH3 (conventional resin-composites). One-way ANOVA and Tukey post-hoc tests were used to detect statistical differences (P<0.01) in edge strength among the materials.

RESULTS: The force (N)-to-fracture at a distance of 0.5 mm from the edge was defined as the Edge Strength. Mean (SD) values of edge strength (N) ranged from 114.0 (7.1) for SDR to 157.8 (6.4) for GrandioSO. These values were significantly different (P<0.01). There was no difference between bulk-fill composites. Chipping was the predominant mode of failure for all materials.

CONCLUSIONS: GrandioSO showed the highest edge strength. Bulk-fill composites had comparable edge strength with conventional resin-composites. SureFil SDR Flow also scored excellent for edge strength.

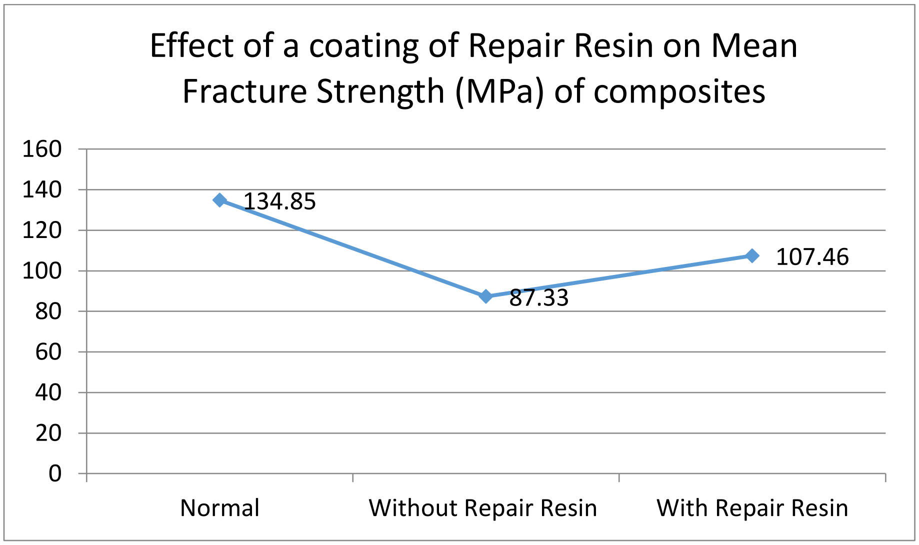
Effect of Repair Resin on Transverse Flexural Strength of Composites

R.T. Abdelsalam and W. De Rijk. IADR 2013, Abstract#2382 [77]

OBJECTIVE: The purpose of this project is to assess the efficacy of Composite Wetting Resin, Ultradent Products Inc., by adding uncured composite to cured composite material. The resin is recommended for repairs where the oxygen inhibited layer may have been disturbed.

The composites that were used were: Aelite, Aelite AP and Reflexions (Bisco Inc.), Empress Dentin, and Tetric (Ivoclar Vivadent), Surefil SDR (Dentsply Inc., and GC Kalore A2.

RESULTS:



CONCLUSION: Groups I,II, and III showed statistically significant differences, ($p<0.5$) , indicating that the overall initial strength is highest for all composites, and that the repair resin increases the TFS across the entire group of the composites, when compared to the specimens repaired without the resin. A wide range TFS was observed for all composites, but all TFS stayed within the ISO4049 requirements.

E. ESTHETIC PROPERTIES

Non-destructive characterization of voids in six flowable composites using swept-source optical coherence tomography.

Nazari A1, Sadr A, Saghiri MA, Campillo-Funollet M, Hamba H, Shimada Y, Tagami J, Sumi Y.

Dent Mater. 2013 Mar;29(3):278-86.[78]

OBJECTIVE: The aim of this study was to evaluate the void frequency (V(F)) and void volume (V(V)) in different flowable composites using swept-source optical coherence tomography (SS-OCT).

Six different flowable composites were tested: Clearfil Majesty LV (MJ; Kuraray), MI Flow (MW; GC), MI Fil (ML; GC), Beautifil flow plus (BF; Shofu), Palfique Estelite low flow (EL; Tokuyama) and Surefil SDR flow (SF; Dentsply).

RESULTS:

Kruskal-Wallis ANOVA and Mann-Whitney U tests revealed significantly different V(F) and V(V) values ($p<0.05$) among the composites. Voids ranging from 35 to 785 µm in diameter were detected in OCT tomograms. MJ showed highest V(F) and V(V) values followed by MW, but ML, BF, EL and SF showed no significant difference. Filler volume in composites showed a positive correlation with void formation, but flowability did not show a specific trend. Micro-CT evaluation validated the V(F) and V(V) calculation by OCT, with a significant correlation in void size ($p<0.001$, $r=0.94$).

CONCLUSION:

The results of this study indicate the reliability of SS-OCT for real-time void characterization of composite materials and restorations. Void formation in flowable composites is material dependent.

Translucency of flowable bulk-filling composites of various thicknesses.

Lassila LV1, Nagas E, Vallittu PK, Garoushi S. Chin J Dent Res. 2012;15(1):31-5.[79]

OBJECTIVE:

To evaluate the translucency characteristics of new flowable bulk-filling resin composites (Venus Bulk Fill and SureFil SDR Flow) at various thicknesses. Experimental short fibre-reinforced composite was also tested.

RESULTS:

Translucency values significantly correlated with thickness of resin composite specimens ($P < 0.05$). For the new types of flowable bulk-filling material, translucency was observed for thicknesses up to 5 to 6 mm, whereas for experimental FC composite, the effect was observed up to 4 to 5 mm, and for control flow and universal filling composites, up to 2 to 3 mm.

CONCLUSION:

New flowable bulk-filling resin composites have less masking ability than conventional universal filling resin composite materials, which should be taken into account when optimum color match and esthetic results are to be achieved.

Surface roughness of flowable resin composites eroded by acidic and alcoholic drinks.

Poggio C1, Dagna A, Chiesa M, Colombo M, Scribante A. J Conserv Dent. 2012 Apr;15(2):137-40. [80]

OBJECTIVE:

The aim of this study is to evaluate the surface roughness of four flowable resin composites following exposure to acidic and alcoholic drinks (SureFil SDR flow, TetricEvoFlow, Esthet-X Flow and Amaris Flow HT). Samples were immersed in artificial saliva, Coca Cola and Chivas Regal Whisky. Each specimen was examined using a Leica DCM 3D microscope.

RESULTS:

Kruskal-Wallis test showed significant differences among various groups (P<0,001). Mann Whitney test was applied and control groups showed significantly lower Sa values than other groups (P=0,008). Coca Cola groups showed highest Sa values (P<0,021). No significant differences (P=0,14) in surface texture were found among the specimens of the different materials.

No significant differences were found among TetricEvoFlow, Esthet-X Flow and Amaris Flow under control conditions nor after Coca Cola application. Under control condition and after Coca Cola application SureFil SDR flow showed significantly higher Sa values. Moreover, after whisky application Amaris Flow showed significantly lower Sa values then the other three groups that showed no significant differences among them.

CONCLUSION:

Acidic and alcoholic drinks eroded the surface roughness of all evaluated flowable resin composites.

Effect of staining solutions and repolishing on color stability of direct composites.

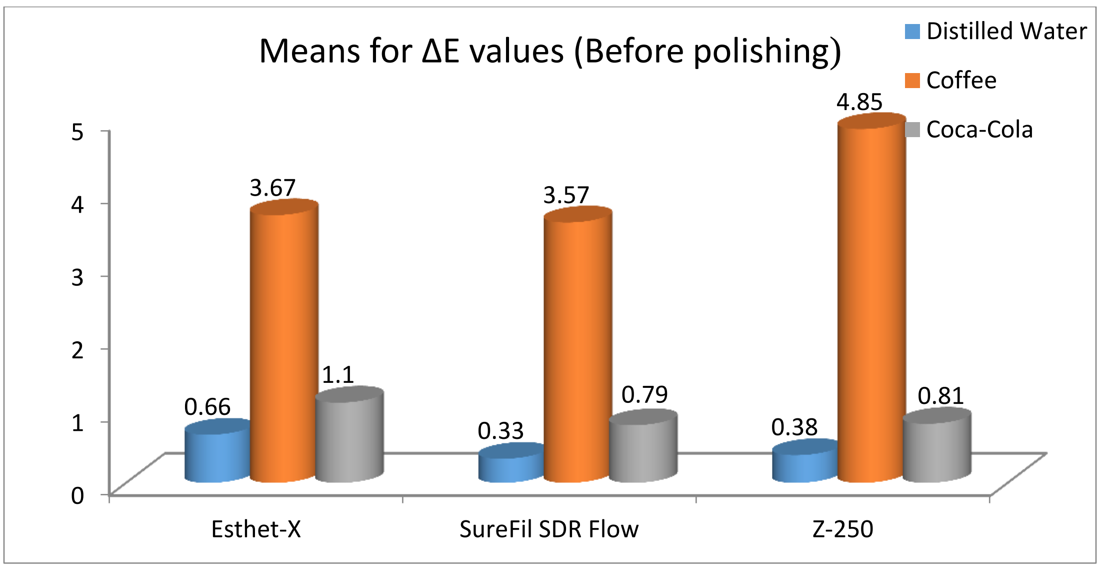
Mundim FM, Garcia Lda F, Pires-de-Souza Fde C. J Appl Oral Sci. 2010 May-Jun;18(3):249-54.[81]

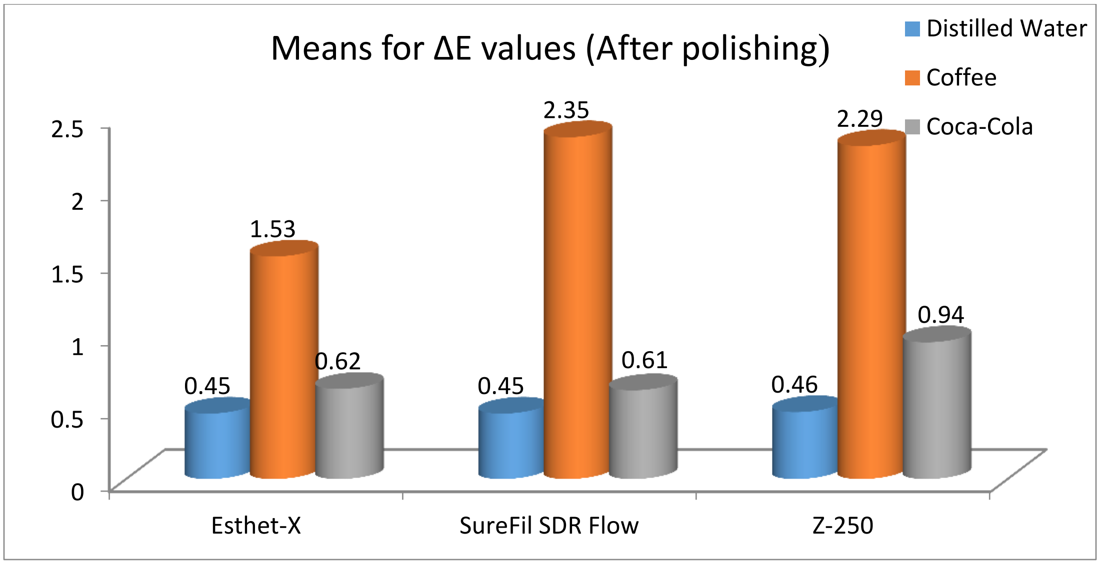
OBJECTIVE:

The purpose of this study was to assess the color change of three types of composite resins (Esthet-X/Dentsply, Filtek Z-250/ 3M ESPE and Surefil SDR Flow/ Dentsply) exposed to coffee and cola drink, and the effect of repolishing on the color stability of these composites after staining.

RESULTS:

There was no statistically significant difference (ANOVA, Tukey's test; $p>0.05$) among the ΔE values for the different types of composites after staining or repolishing. For all composite resins, coffee promoted more color change (ΔE>3.3) than distilled water and the cola soft drink. After repolishing, the ΔE values of the specimens immersed in coffee decreased to clinically acceptable values (ΔE<3.3), but remained significantly higher than those of the other groups.





CONCLUSION:

No significant difference was found among composite resins or between color values before and after repolishing of specimens immersed in distilled water and cola. Immersing specimens in coffee caused greater color change in all types of composite resins tested in this study and repolishing contributed to decrease staining to clinically acceptable ΔE values.

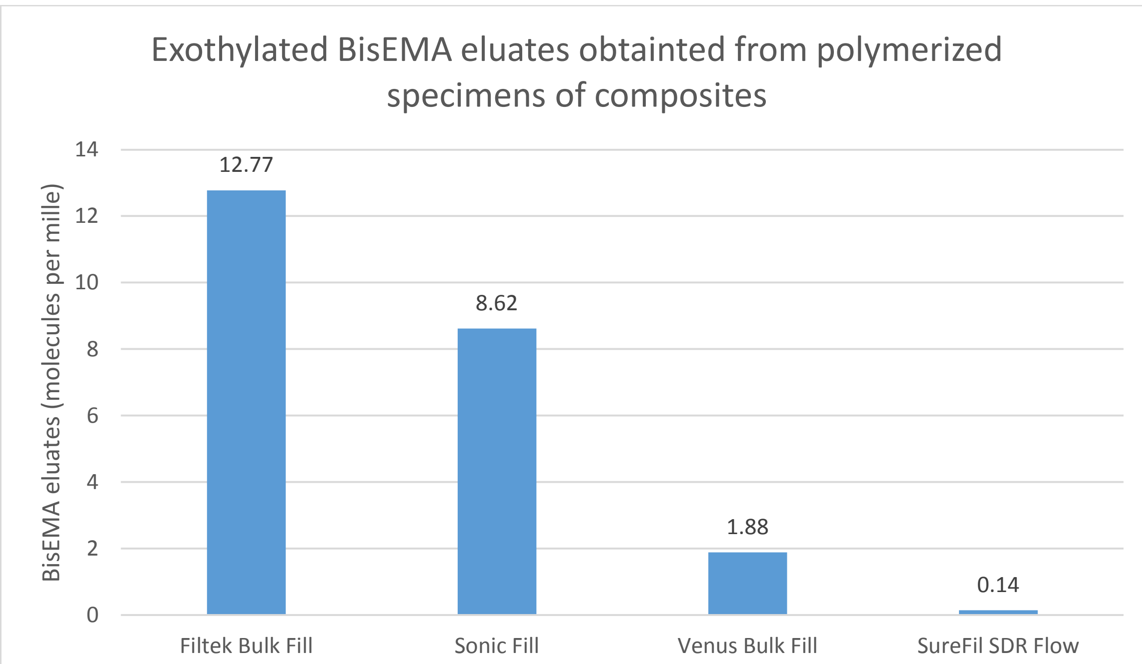
F. BIOCOMPATIBILITY

Determination of homologous distributions of bisEMA dimethacrylates in bulk-fill resin-composites by GC-MS.

Durner J, Schrickel K, Watts DC, Ilie N. Dent Mater. Apr 2015; 31(4):473-80.[82]

OBJECTIVE: The hydrophobic basic monomer bisEMA is used in dental restoratives to reduce viscosity of the material. This study used high-temperature gas chromatography/mass spectrometry (HT-GC/MS) to identify and compare ethoxylated bisEMA eluates from polymerized specimens of four bulk-fill resin composites – Venus bulk fill, Surefil SDR flow, Filtek Bulk Fill and Sonic Fill. Additionally, the unpolymerised pastes were analysed.

RESULTS:



CONCLUSION: BisEMA was found in eluates from polymerized specimen from all examined bulk fill materials. Higher ethoxylation degrees were detected in unpolymerised materials. SureFil SDR Flow had the lowest ethoxylated BisEMA eluates obtained from polymerized specimens. These findings may be significant for toxicological analysis of composites.

Influence of bulk-fill and cavity-depth on occurrence of postoperative sensitivity

Ragab HM, Ghandour RM. IADR 2015, Abstract # 0863[83]

OBJECTIVE: This randomized-controlled clinical study aimed to evaluate the influence of bulk-fill intermediary layer (SureFil SDR Flow) and the cavity depth on the occurrence of postoperative-sensitivity in single-surface cavities for posterior composite-resin restorations.

RESULTS: Cavities were randomly allocated to one of two placement methods: incremental-layering using CeramX-Mono(control) and bulk-fill using SDR veneered with CeramX-Mono. All cases showed no post-operative senstitivity at one-week or one-month results. However, in deep-cavity group, layering-technique showed significantly higher prevalence of mild sensitivity than bulk-fill one-day after restoration. There was no significant difference between the two techniques after one-week.

CONCLUSION: Deep cavities are more likely to develop POS than medium-depth cavities. Although Bulk-fill technique may minimize POS in deep class I cavities

REFERENCES

References

1. Kim RJ, Kim YJ, Choi NS, Lee IB. Polymerization shrinkage, modulus, and shrinkage stress related to tooth-restoration interfacial debonding in bulk-fill composites. J Dent 2015;43(4):430-9.
2. Francis A, Braxton A, Ahmad W, et al. Cuspal Flexure and Extent of Cure of a Bulk-fill Flowable Base Composite. Oper Dent 2015.
3. Jang JH, Park SH, Hwang IN. Polymerization Shrinkage and Depth of Cure of Bulk-Fill Resin Composites and Highly Filled Flowable Resin. Oper Dent 2014.
4. Kaisarly D EGM, Roesch P, Hickel R, Kunzelmann K. Shrinkage vectors in bulk versus incrementally applied sdr bulkfill composite.; IADR 2015, Abstract#0383.
5. Shin D SB. Polymerization Shrinkage and Contraction Stress of Bulk-fill Composites; IADR 2015, Abstract # 0384.
6. Olafsson VG RA, Swift EJ, Boushell LW, Ko C, Donovan TE. Effect of composite type and placement technique on shrinkage stress; IADR 2015, Abstract #2198.
7. Fronza BM AA, Pacheco RR, Ambrosano GM, Braga R, Rueggeberg FA, Giannini M. Polymerization shrinkage stress and biaxial flexural strength of bulk-fill composites; IADR 2015, Abstract #2197.
8. Garcia D, Yaman P, Dennison J, Neiva G. Polymerization shrinkage and depth of cure of bulk fill flowable composite resins. Oper Dent 2014;39(4):441-8.
9. D. Garcia PY, J. Dennison, and G. Neiva. Polymerization Shrinkage and Hardness of Three Bulk Fill Flowable Resins. AADR 2012, Abstract#860.
10. El-Damanhoury H, Platt J. Polymerization Shrinkage Stress Kinetics and Related Properties of Bulk-fill Resin Composites. Oper Dent 2013.
11. H.M. El-Damanhoury NAE, and J.A. Platt. Polymerization Shrinkage Stress Kinetics of Five Bulk-Fill Resin Composites IADR 2013, Abstract#2439.
12. Burgess J, Cakir D. Comparative properties of low-shrinkage composite resins. Compend Contin Educ Dent 2010;31 Spec No 2:10-5.
13. R. Hirata EC, M. Giannini, M.N. Janal, N. Tovar, and P.G. Coelho. A Novel Three-dimensional Micro-computed Tomography Evaluation of Resin Composite Shrinkage. AADR 2014, Abstract#177.
14. P. Thakur YC, and A.S. Fok. Measuring Shrinkage Stress in Model Restorations using Digital Image Correlation. IADR 2014, Abstract#211.
15. C. Francci LCYaCP. Volumetric Shrinkage and Conversion of Low-Stress Flowable Dental Composites. IADR 2012, Abstract#1057.
16. S.A. Godbole PB, D. Cakir-Ustun, L.C. Ramp, J. Lemons, and J. Burgess. Polymerization Shrinkage Strain Produced By Composite Resins. IADR 2013, Abstract#1115.
17. G. Natarajarathinam ISM, C. Michelson, P. Beck, M. Litaker, D. Cakir, J. Lemons, and J. Burgess. Polymerization Shrinkage Strain Produced by Low-Shrinkage Composite Resins. IADR 2011, Abstract#603.
18. AlSagob E BD, Khayat S, Stark PC, Ali A. Comparison of microleakage between bulk-fill flowable and nanofilled resin-based composites; IADR 2015, Abstract #0648.

References

19. Taschner M LR, Petschelt A, Zorzin J. Marginal quality of five different bulk-fill composites in deep cavities.; IADR 2015, Abstract #0653.
20. Scotti N, Comba A, Gambino A, et al. Microleakage at enamel and dentin margins with a bulk fills flowable resin. Eur J Dent 2014;8(1):1-8.
21. Campos EA, Ardu S, Lefever D, et al. Marginal adaptation of class II cavities restored with bulk-fill composites. J Dent 2014;42(5):575-81.
22. E.A. Campos FFJ, S. Ardu, T. Bortolotto, D. Lefever, and I. Krejci. Marginal adaptation of class II cavities restored with bulk-fill composites. IADR 2012, Abstract#2316.
23. Furness A, Tadros MY, Looney SW, Rueggeberg FA. Effect of bulk/incremental fill on internal gap formation of bulk-fill composites. J Dent 2014;42(4):439-49.
24. M. Tadros AF, S. Looney, and F. Rueggeberg. Effect of Bulk/Incremental Fill on Internal Integrity of Bulk-fill Composites. AADR 2012, Abstract#459.
25. Juloski J, Carrabba M, Aragoneses JM, et al. Microleakage of Class II restorations and microtensile bond strength to dentin of low-shrinkage composites. Am J Dent 2013;26(5):271-7.
26. Hernandes NM, Catelan A, Soares GP, et al. Influence of flowable composite and restorative technique on microleakage of class II restorations. J Investig Clin Dent 2013.
27. Nazari A, Sadr A, Shimada Y, Tagami J, Sumi Y. 3D assessment of void and gap formation in flowable resin composites using optical coherence tomography. J Adhes Dent 2013;15(3):237-43.
28. Nazari A SA, Shimada Y, Tagami J, Sumi Y. 3D assessment of void and gap formation in flowable resin composites using optical coherence tomography. . AADR 2012, Abstract#162.
29. Roggendorf MJ, Kramer N, Appelt A, Naumann M, Frankenberger R. Marginal quality of flowable 4-mm base vs. conventionally layered resin composite. J Dent 2011;39(10):643-7.
30. B.M. Fronza APAA, G.M.B. Ambrosano, F.A. Rueggeberg, and M. Giannini. Adhesion of Bulk Fill Restorative Systems in Class I Cavities. AADR 2014, Abstract#460.
31. A.F. Reis RSDA, S. Bertrand, Q. Dai, and X. Jin. Marginal Assessment of Cavities Restored with a Low-stress Bulk-filling Composite. AADR 2010, Abstract#654.
32. P. Segal SM, S. Levartovsky and A. Ben-Amar. The marginal seal of class II restorations using bulk-fill composite. IADR 2013, Abstract#180318.
33. A. Zubani FB, E. Nembrini, P.A. Acquaviva, and A. Cerutti. Marginal Adaptation of New Bulk Fill Composites: Microscopical Evaluation. IADR 2012, Abstract#385.
34. C. Munoz-Viveros ARY, I. Agarwal, and M. Campillo-Funollet. Microleakage of Class II Preparations Restored With The SonicFill System. AADR 2012, Abstract#466.
35. M. Irie YT, Y. Maruo, G. Nishigawa, M. Oka, S. Minagi, K. Suzuki, and D.C. Watts. Early No Interfacial-Gap Incidence vs. Flexural Modulus with Injectable Composites. IADR 2011, Abstract#3203.
36. M.K. Kreitzer MH, M. Finkelman, and G. Kugel. Microleakage Evaluation of Bulk-Fill Layering Techniques in Class II Restorations. IADR 2013, Abstract#3554.

37. A. Murray CB, F. Qian, R. Nessler, and M. Vargas. Insertion Technique and Marginal Adaptation of Class II Composite Restorations. IADR 2011, Abstract#3206.
38. Marovic D, Taubock TT, Attin T, Panduric V, Tarle Z. Monomer conversion and shrinkage force kinetics of low-viscosity bulk-fill resin composites. Acta Odontol Scand 2014:1-7.
39. Tenorio IP RdMG, Reis AF, Rodrigues JA, Shen C, Roulet J. Comparing Depth-dependent Curing Energy Density of Bulk-fill and Conventional Composites; IADR 2015, Abstract #0667.
40. Harlow J SB, Price RB, Labrie D. Light transmission through conventional and bulk filling resin based composites.; IADR 2015, Abstract #0668
41. Bui M MA, Harsono M, Janyavula S, Perry RD, Kugel G. Effect of Curing Distances on the Bulk-fill Composites; IADR 2015, Abstract #2202.
42. Kabil SH YM, Harhash AY. Depth of cure and adaptation of bulk-fill resin composites.; IADR 2015, Abstract #2203.
43. Tiba A VR, Estrich C. Clinically-relevant measurements of depth of cure of bulk-fill composites; IADR 2015, Abstract #2204.
44. Alptosunoğlu E BG, Yildirim G, Ozcan S, Uctasli MB, Lassila L, Bijelic-Donova J. Comparison of Microhardness and Curing Depth of Two Bulkfill Dentin Materials IADR 2015, Abstract#2205.
45. Goracci C, Cadenaro M, Fontanive L, et al. Polymerization efficiency and flexural strength of low-stress restorative composites. Dent Mater 2014;30(6):688-94.
46. Alshali RZ, Silikas N, Satterthwaite JD. Degree of conversion of bulk-fill compared to conventional resin-composites at two time intervals. Dent Mater 2013;29(9):e213-7.
47. Alshali RZ SN, Satterthwaite JD. Degree of conversion of bulk-fill compared to conventional resin-composites at two time intervals. . IADR 2013, Abstract#1906.
48. Czasch P, Ilie N. In vitro comparison of mechanical properties and degree of cure of bulk fill composites. Clin Oral Investig 2013;17(1):227-35.
49. Flury S, Hayoz S, Peutzfeldt A, Husler J, Lussi A. Depth of cure of resin composites: is the ISO 4049 method suitable for bulk fill materials? Dent Mater 2012;28(5):521-8.
50. D.C. Watts AS. Transmission from Light-Cure Units and Bulk-Fill Composite Cure-Depths. AADR 2014, Abstract#179.
51. El-Mowafy. HME-SaO. Depth of Cure of Two Bulk-fill Composites: Micro-hardness Analysis. IADR 2014, Abstract#1496.
52. M. Alshaafi MQA, T. Haenel, R.B. Price, and J. Fahey. Effect of Thickness on the Properties of Bulk Cured Resins. IADR 2013, Abstract#2434.
53. I. Pedalino KV, G. Hartup, and P. Rogers. Depth of Cure of New Flowable Composite Resins. AADR 2012, Abstract#254.
54. S. Zawawi NB, and D. Nathanson. Curing Duration vs Depth of Cure and Modulus of Bulk-Fill-Composites. IADR 2012, Abstract#121.
55. S. Zawawi NB, and D. Nathanson. Curing Mode and Duration Effect on Polymerization Of Bulk-Fill Composites. IADR 2012, Abstract#515.
56. H. Kunduru MF, E.H. Doherty, M. Harsono, and G. Kugel. Depth of Cure of Different Shades of Bulk Fill Composites. IADR 2013, Abstract#2437.

57. N. Brulat-Bouchard SZ, and D. Nathanson. Effect of LED Curing Units on Properties of Bulk-Fill Composites. IADR 2012, Abstract#516.
58. L. Dalmagro Peruchi CSB, N. Sartori, J. Phark, and S. Duarte. The effect of trans-dental light-polymerization on low-shrinkage and flowable composites. IADR 2011, Abstract#588.
59. A. Tiba AH, and G. Zeller. Examining The Depth of Cure for Bulk Fill Composite Materials. IADR 2013, Abstract#2435.
60. Alshali RZ, Salim NA, Satterthwaite JD, Silikas N. Post-irradiation hardness development, chemical softening, and thermal stability of bulk-fill and conventional resin-composites. J Dent 2015;43(2):209-18.
61. Soares CJ CV, Rosatto CM, Bicalho AA, Ferreira MS, Tantbirojn DV, Versluis A. Mechanical Properties and Cusp Deflection of Bulk Fill Composite Resins IADR 2015, Abstract # 2193.
62. Deif M DA, El-Badrawy W, El-Hadary A, Kandil M, Hosney S. Radiopacity of a group of bulk-fill composite restoratives; IADR 2015,Abstract # 2209.
63. Ilie N, Schoner C, Bucher K, Hickel R. An in-vitro assessment of the shear bond strength of bulk-fill resin composites to permanent and deciduous teeth. J Dent 2014.
64. Juloski J, Goracci C, Radovic I, et al. Post-retentive ability of new flowable resin composites. Am J Dent 2013;26(6):324-8.
65. Ilie N, Bucuta S, Draenert M. Bulk-fill resin-based composites: an in vitro assessment of their mechanical performance. Oper Dent 2013;38(6):618-25.
66. Ilie. N. Bulk-fill Resin-based Composites: an in-vitro assessment of their mechanical performance. IADR 2013, Abstract#2442.
67. Lachowski KM, Botta SB, Lascala CA, Matos AB, Sobral MA. Study of the radio-opacity of base and liner dental materials using a digital radiography system. Dentomaxillofac Radiol 2013;42(2):20120153.
68. El-Safty S, Akhtar R, Silikas N, Watts DC. Nanomechanical properties of dental resin-composites. Dent Mater 2012;28(12):1292-300.
69. Giovannetti A, Goracci C, Vichi A, et al. Post retentive ability of a new resin composite with low stress behaviour. J Dent 2012;40(4):322-8.
70. Salerno M, Derchi G, Thorat S, et al. Surface morphology and mechanical properties of new-generation flowable resin composites for dental restoration. Dent Mater 2011;27(12):1221-8.
71. DeLong R, Pintado MR, Douglas WH, et al. Wear of a dental composite in an artificial oral environment: A clinical correlation. J Biomed Mater Res B Appl Biomater 2012;100(8):2297-306.
72. S. Zawawi RP, and D. Nathanson. Temperature rise during photocuring of bulk-fill composites. AADR 2014, Abstract#8.
73. V.K. Kalavacharla RR, Q. Cai, D. Cakir, P. Beck, L. Ramp, and J. Burgess. Mechanical Properties of Flowable Composite Resins and a Giomer. AADR 2012, Abstract#847.
74. H. Abouelleil TM, C. Villat, P. Colon, B. Grosgogeat, and N. Pradelle-Plasse. Evaluation of a fibre reinforced composite properties for bulk filling. IADR 2013, Abstract#207.

References

75. K. Sawlani PB, L.C. Ramp, D. Cakir-Ustun, and J. Burgess. In Vitro Wear of Eight Bulk Placed and Cured Composites. IADR 2013, Abstract#2441.
76. N. Silikas MZ, and D. Watts. Edge strength of bulk-fill and conventional resin-composites. IADR 2012, Abstract#514.
77. Rijk. RTAaWD. Effect of Repair Resin on Transverse Flexural Strength of Composites. IADR 2013, Abstract#2382.
78. Nazari A, Sadr A, Saghiri MA, et al. Non-destructive characterization of voids in six flowable composites using swept-source optical coherence tomography. Dent Mater 2013;29(3):278-86.
79. Lassila LV, Nagas E, Vallittu PK, Garoushi S. Translucency of flowable bulk-filling composites of various thicknesses. Chin J Dent Res 2012;15(1):31-5.
80. Poggio C, Dagna A, Chiesa M, Colombo M, Scribante A. Surface roughness of flowable resin composites eroded by acidic and alcoholic drinks. J Conserv Dent 2012;15(2):137-40.
81. Mundim FM, Garcia Lda F, Pires-de-Souza Fde C. Effect of staining solutions and repolishing on color stability of direct composites. J Appl Oral Sci 2010;18(3):249-54.
82. Durner J, Schrickel K, Watts DC, Ilie N. Determination of homologous distributions of bisEMA dimethacrylates in bulk-fill resin-composites by GC-MS. Dent Mater 2015;31(4):473-80.
83. Ragab HM GR. Influence of bulk-fill and cavity-depth on occurrence of postoperative sensitivity; IADR 2015, Abstract # 0863.