A World of Proof
Discover the power of fibres

everX Posterior™
& everX Flow™
from GC

Study compilation

March 2020

Picture: courtesy of Dr. Lassila, University of Turku, Finland

GC

Discover **everX** and the world of fibre reinforcement

everX fibre-reinforced composites have been developed to replace dentine in direct restorations (together with a conventional composite as enamel layer).

Researchers all around the world are investigating and documenting the clinical and laboratory evidence of their effectiveness.

The volume and extent of supportive independent research on everX composites, as summarised here, clearly emphasise the global significance of these remarkable products.

The purpose of this literature collection is to provide the clinician with scientific and clinical related evidences highlighting the excellent performance of GC's fibre-reinforced composites as a treatment option for all fragilised, deep and large cavities.

Contents

Based on proprietary GC technologies…

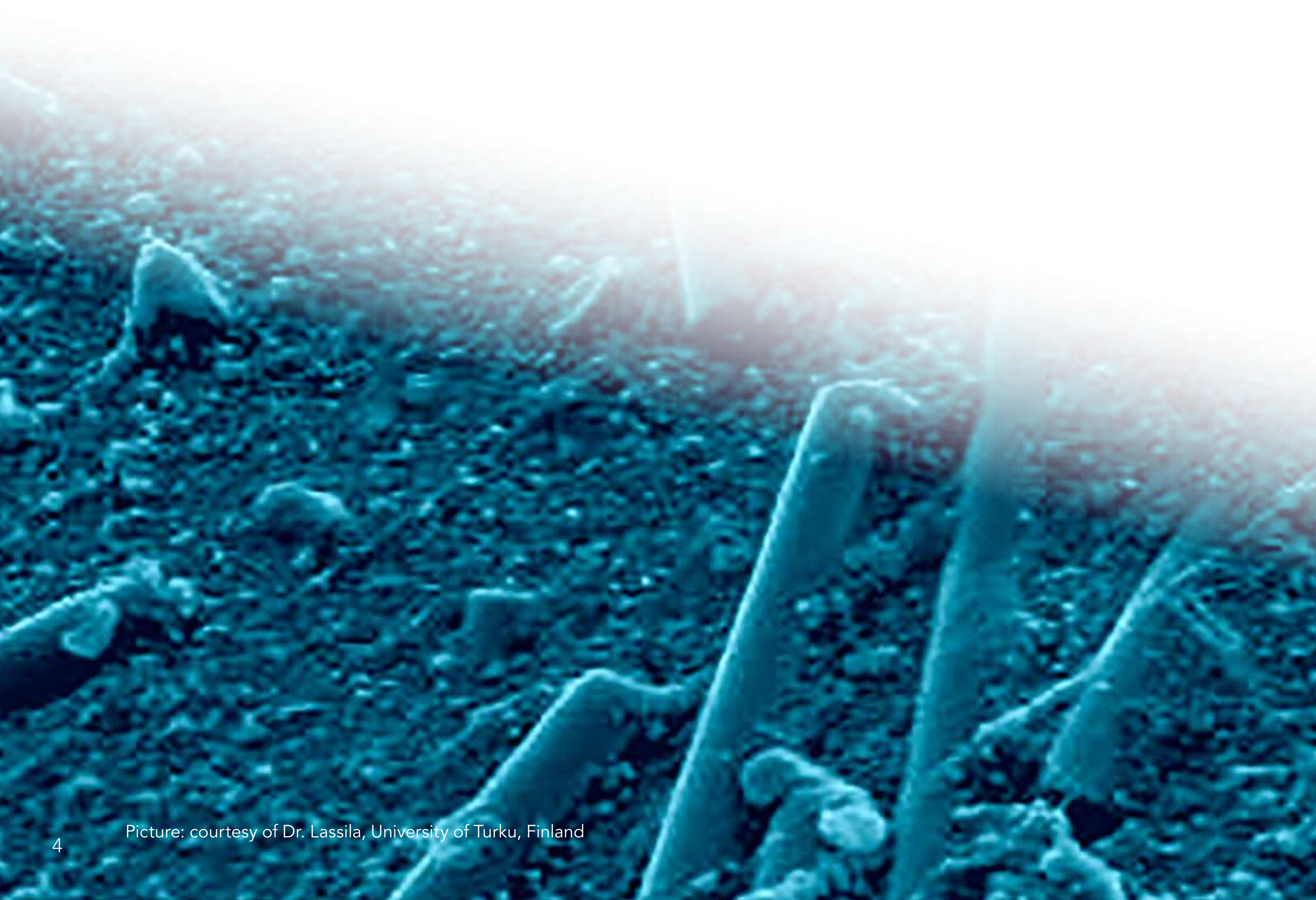
Optimal Aspect Ratio (OAR)

Fibre aspect ratio is the ratio of length to diameter of a fibre. To obtain a sufficient stress transfer from the matrix to the fibres and thus an efficient reinforcement of the restoration, this ratio needs to be optimised. This has been done in everX Posterior and everX Flow with the **OAR technology**. Owing to this technology, an exceptional resistance-to-fracture could be reached even for everX Flow, which contains much shorter fibres than everX Posterior.

Full-coverage Silane Coating (FSC)

Other important features that impact the strength and toughness of the materials are the interfacial adhesion strength between fibre and polymer matrix and also the filler load. Sufficient adhesion between the fibre and polymer matrix is necessary for a good local transfer of the load from the matrix to the stronger fibre. The **FSC technology**, used in everX Flow, improves the coupling between fibre and matrix, rendering a positive impact on both these features.

The interplay between the interfacial adhesion strength, tensile strength of the fibre and the fibre aspect ratio determine their **reinforcing efficiency**.



Picture: courtesy of Dr. Lassila, University of Turku, Finland

The toughest composite substructure to reinforce your restorations

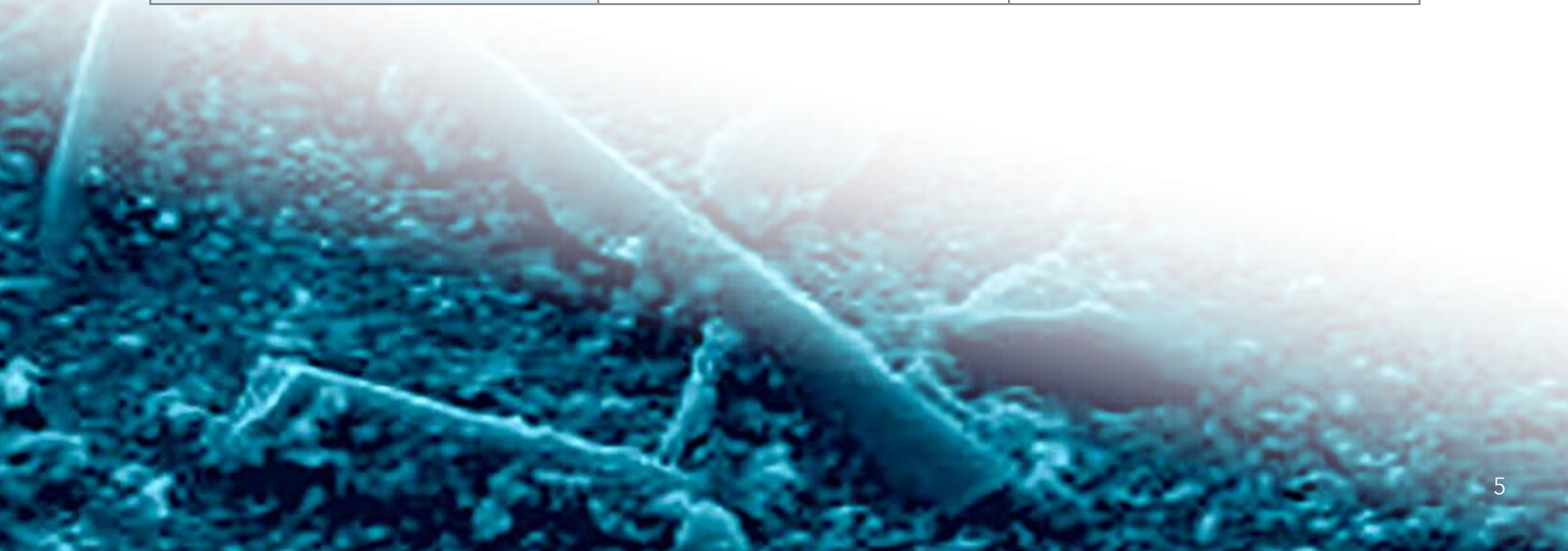
The advantages of everX fibre-reinforced composites

- Optimal to strengthen large restorations thanks to the reinforcing effect of fibres
- Excellent fracture toughness, to reinforce weakened or cracked teeth
- Designed to redirect or arrest crack propagation, thus reducing the risk of catastrophic failures
- Two consistencies: packable (everX Posterior) or flowable (everX Flow)

Indications

everX Posterior	everX Flow
Dentine replacement in large posterior cavities, deep cavities and endo-treated teeth, cavities with missing cusps or after amalgam removal, cavities where inlays and onlays would also be recommended	
	Dentine replacement in smaller cavities
	Core build-up

	everX Posterior	everX Flow
Glass fibres	E-glass fibres	E-glass fibres
Average length of fibres	800µm	140µm
Diameter of fibres	17µm	6µm
Particulate fillers	Barium glass	Barium glass
Main monomers in resin matrix	Bis-GMA, TEGDMA	Bis-MEPP, TEGDMA, UDMA
% of fibres (w/w)	5-15%	25%
% of particle fillers (w/w)	Barium glass: 60-70% Silicon dioxide: 1-5%	Barium glass: 42-52% Silicon dioxide: Trace
% of resin matrix (w/w)	Bis-GMA: 10-20% TEGDMA: 5-10%	Bis-MEPP: 15-25% TEGDMA: 1-10% UDMA: 1-10%



Packable fibre-reinforced composite (everX Posterior)

General overviews on fibre-reinforced composites

Fibre-reinforced composites are acknowledged by their excellent mechanical properties. They have further increased the clinical potential uses of composites within restorative dentistry by increasing the treatment possibilities.

Books and chapters

1. Bilayered restorative dental composite structures: Stress and fracture behavior.
   Omran T
   Thesis Book, University of Turku 2019

2. Biomimetic Restoration of Endodontically Treated Posterior Teeth. by Forster A.
   Thesis Book, University of Szeged 2019.

3. Fiber-Reinforced Composites (Book Chapter) by Garoushi S.
   In: Miletic V. (eds) Dental Composite Materials for Direct Restorations. Springer International Publishing 2018

4. Fillings and core-build ups (Book Chapter) by Keulemans F, Garoushi S & Lassila L.
   In: A Clinical Guide to Principles of Fibre Reinforced Composites (FRCs) in Dentistry by Vallittu P & Özcan M. Woodhead Publishing 2017.

5. Discontinuous fiber reinforced composite for dental applications.
   Bijelic-Donova J. Thesis Book, University of Turku 2016

6. The Restorative Use of Fibre-Reinforced Materials in the Posterior Region.
   Fráter M. Thesis Book.
   University of Szeged 2015.

7. Bilayered Dental Composite Resin: Load Bearing Capacity of Combinations of Fibre-Reinforced and Particulate-Filler Composite.
   Garoushi S.
   Thesis Book, University of Turku 2006

Reviews

1. Fiber Reinforcement of Endodontically Treated Teeth: What Options Do We Have?
   Garoushi S, Tanner J, Keulemans F, Le Bell-Rönnlöf A, Lassila L Vallittu P.
   Eur J Prosthodont Restor Dent 2020 in press

2. Short fiber reinforced composite restorations: A review of the current literature.
   Garoushi S, Gargoum A, Vallittu P, Lassila L.
   J Investig Clin Dent. 2018 Aug;9(3):e12330.

Clinical performance of everX Posterior restorations

Confirming the previously mentioned laboratory data, many authors have demonstrated in their clinical reports that using everX Posterior as a bulk base or core under direct composite restorations for posterior teeth can be considered an economical and practical measure that could obviate the use of extensive prosthetic treatment.

1. 24-Month Clinical Evaluation of Different Bulk-Fill Restorative Resins in Class II Restorations.
   Guney T, Yazici AR.
   Oper Dent 2020 [Epub ahead of print]

2. Clinical evaluation of fiber-reinforced composite restorations in posterior teeth - results of 2.5 year follow-up
   Tanner J, Tolvanen M, Garoushi S, Säilynoja E.
   Open Dent J. 2018 Jun 29;12:476-485.

3. Endodontic Management of a Mandibular First Molar with Radix Entomolaris and Conservative Post-endodontic Restoration with CAD/CAM Onlay: A Novel Clinical Technique.
   Yadav K, De Ataide IN, Fernandes M, Lambor R, Alreja D.
   J Clin Diagn Res. 2016 Nov;10(11):ZD13-ZD15.

4. Fibre reinforcement in a structurally compromised endodontically treated molar: a case report.
   Soares R, de Ataide Ide N, Fernandes M, Lambor R.
   Restor Dent Endod. 2016 May;41(2):143-7.

5. A practical approach in conservative management of vertical coronal fracture in molar: A case report.
   Shah J, Raghavendra S, Gathani K, Wadekar S.
   IIOABJ. 2016;7:42-44.

6. Preliminary clinical evaluation of short fiber-reinforced composite resin in posterior teeth: 12-months report.
   Garoushi S, Tanner J, Vallittu P, Lassila L.
   Open Dent J. 2012;6:41-5. doi: 10.2174/1874210601206010041.

Publications on key features

Mechanical properties and structural characterisation of everX Posterior

The fracture-related material properties, such as fracture resistance, deformation under occlusal load, and the marginal degradation of materials are usually evaluated in vitro by the determination of the basic material parameters of fracture toughness, flexural properties, static and fatigue load-bearing capacity and microhardness. The following laboratory studies have demonstrated the improved mechanical properties of everX Posterior - especially fracture toughness and flexural strength - in comparison to the tested bulk fill or conventional commercial composite resins.

1. R-curve behavior of a short-fiber reinforced resin composite after water storage.
   Tiu J, Belli R, Lohbauer U.
   J Mech Behav Biomed Mater 2020;104:103674.

2. Evaluation of fracture resistance of endodontically treated maxillary premolars restored with three different core materials: an in vitro study.
   Sah SP, Datta K, Velmurugan N, Lakshmanan G, Karthik L. Int J Oral Health Med Res 2018;5(6):31-37.

3. Hardness and fracture toughness of resin-composite materials with and without fibers
   Dent Mater 2019;35(8):1194–1203.

4. The fracture resistance of fiber reinforced composite restorative material has higher yield than nanohybrid resin composite.
   Kurniawati CS, Rachmawati D and Mas'adah D.
   Journal of Physics: Conf. Series 1073 (2018) 052019

5. Effect of resin thickness and light-curing distance on the diametral tensile strength of short fibre-reinforced resin composite.
   M Medikasari, E Herda and B Irawan
   J. Phys.: Conf. Ser. 2018: 1073 052015

6. Simulated cuspal deflection and flexural properties of high viscosity bulk-fill and conventional resin composites.
   Tsujimoto A, Nagura Y, Barkmeier WW, Watanabe H, Johnson WW, Takamizawa T, Latta MA, Miyazaki M.
   J Mech Behav Biomed Mater. 2018 Jul 26;87:111-118.

7. Comparative evaluation of wear resistance of cast gold with bulk-fill composites an in vitro study.
   Kumar A, Sarthaj AS, Majumder DS.
   J Conserv Dent. 2018 May-Jun;21(3):302-305. doi: 10.4103/JCD.JCD_196_17.

8. Evaluation of Mechanical Properties of Newer Nanoposterior Restorative Resin Composites: An In vitro Study.
   Meenakumari C, Bhat KM, Bansal R, Singh N.
   Contemp Clin Dent. 2018 Jun;9(Suppl 1):S142-S146. doi: 10.4103/ccd.ccd_160_18.

9. Physicochemical properties of discontinuous S2-glass fiber reinforced resin composite
   Huang Q, Qin W, Garoushi S, He J, Lin Z, Liu F, Vallittu PK, Lassila LVJ.
   Dent Mater J. 2018 Jan 30;37(1):95-103. doi: 10.4012/dmj.2017-078.

10. Resistance curves of short-fiber reinforced methacrylate-based biomedical composites
    Michael Wendler, Renan Belli, Martina Schachtner, Gudrun Amberger, Anselm Petschelt, Tobias Fey, Ulrich Lohbauer.
    Engineering Fracture Mechanics. 2018;190: 146–158.

11. Mechanical Properties and Wear of Five Commercial Fibre-Reinforced Filling Materials.
    Garoushi S, Vallittu PK, Lassila L.
    Chin J Dent Res. 2017;20(3):137-143. doi: 10.3290/j.cjdr.a38768.

12. Properties of discontinuous S2-glass fiber-particulate-reinforced resin composites with two different fiber length distributions.
    Huang Q, Garoushi S, Lin Z, He J, Qin W, Liu F, Vallittu PK, Lassila LV.
    J Prosthodont Res. 2017 Mar 23. pii: S1883-1958(17)30018-X. doi: 10.1016/j.jpor.2017.03.002.

13. Mechanical and structural characterization of discontinuous fiber-reinforced dental resin composite.
    Bijelic-Donova J, Garoushi S, Lassila LV, Keulemans F, Vallittu PK.
    J Dent. 2016 Sep;52:70-8. doi: 10.1016/j.jdent.2016.07.009.

14. Relationship between mechanical properties and bond durability of short fiber-reinforced resin composite with universal adhesive.
    Tsujimoto A, Barkmeier WW, Takamizawa T, Watanabe H, Johnson WW, Latta MA, Miyazaki M.
    Eur J Oral Sci. 2016 Oct;124(5):480-489. doi: 10.1111/eos.12291.

15. Mechanical properties of fiber reinforced restorative composite with two distinguished fiber length distribution.
Lassila L, Garoushi S, Vallittu PK, Säilynoja E.
J Mech Behav Biomed Mater. 2016 Jul;60:331-338. doi: 10.1016/j.jmbbm.2016.01.036.

16. Mechanical properties, fracture resistance, and fatigue limits of short fiber reinforced dental composite resin.
Bijelic-Donova J, Garoushi S, Vallittu PK, Lassila LV.
J Prosthet Dent. 2016 Jan;115(1):95-102. doi: 10.1016/j.prosdent.2015.07.012.

17. Surface and bulk properties of dental resin-composites after solvent storage.
Sunbul HA, Silikas N, Watts DC.
Dent Mater. 2016 Aug;32(8):987-97. doi: 10.1016/j.dental.2016.05.007.

18. Mechanical properties, volumetric shrinkage and depth of cure of short fiber-reinforced resin composite.
Tsujimoto A, Barkmeier WW, Takamizawa T, Latta MA, Miyazaki M.
Dent Mater J. 2016;35(3):418-24. doi: 10.4012/dmj.2015-280.

19. Effect of aging on the flexural strength and fracture toughness of a fiber reinforced composite resin versus two nanohybrid composite resin.
Abdul-Monem MM, El-Gayar IL, Al-Abbassy FH.
Alexandria Dental Journal. 2016; 41:328-335.

20. Comparison of mechanical properties of a new fiber reinforced composite and bulk filling composites.
Abouelleil H, Pradelle N, Villat C, Attik N, Colon P, Grosgogeat B.
Restor Dent Endod. 2015 Nov;40(4):262-70. doi: 10.5395/rde.2015.40.4.262.

21. Polymerization efficiency and flexural strength of low-stress restorative composites.
Goracci C, Cadenaro M, Fontanive L, Giangrosso G, Juloski J, Vichi A, Ferrari M.
Dent Mater. 2014 Jun;30(6):688-94. doi: 10.1016/j.dental.2014.03.006.

21. Physical properties and depth of cure of a new short fiber reinforced composite.
Garoushi S, Säilynoja E, Vallittu PK, Lassila L.
Dent Mater. 2013 Aug;29(8):835-41. doi: 10.1016/j.dental.2013.04.016.

22. Fracture toughness, compressive strength and load-bearing capacity of short glass fibre-reinforced composite resin.
Garoushi S, Vallittu PK, Lassila LV.
Chin J Dent Res. 2011;14(1):15-9.

23. Effect of particulate nanofiller on the surface microhardness of glass fiber reinforced filling composite.
Garoushi S, Vallittu PK, Lassila LVJ.
The Chinese Journal of Dental Research 2008; 11:20-24.

24. Short glass fiber-reinforced composite with a semi-interpenetrating polymer network matrix for temporary crowns and bridges.
Garoushi SK, Vallittu PK, Lassila LV.
J Contemp Dent Pract. 2008 Jan 1;9(1):14-21.

25. Fiber reinforced particulate filler composite resin.
Garoushi S. Finnish Dental Journal (Suomen Hammaslääkärilehti 2007; 3:100-101).

26. Static and fatigue compression test for particulate filler composite resin with fiber-reinforced composite substructure.
Garoushi S, Lassila LV, Tezvergil A, Vallittu PK.
Dent Mater. 2007 Jan;23(1):17-23.

27. Short glass fiber reinforced restorative composite resin with semi-inter penetrating polymer network matrix.
Garoushi S, Vallittu PK, Lassila LV.
Dent Mater. 2007 Nov;23(11):1356-62.

28. Load bearing capacity of fibre-reinforced and particulate filler composite resin combination.
Garoushi S, Lassila LV, Tezvergil A, Vallittu PK.
J Dent. 2006 Mar;34(3):179-84.

Polymerisation shrinkage and microleakage of everX Posterior

A trend is showing that the use of everX Posterior as a bulk base of bilayered, biomimetic direct composite restorations in large Class I and II cavities decreases the leakage in comparison with conventional composites.

1. Color stability of bulk-fill and universal composite restorations with dissimilar dentin replacement materials.
   Miletic V, Marjanovic J, Veljovic DN, Stasic JN, Petrovic V.
   J Esthet Restor Dent 2019;31:520-528.

2. Polymerization Shrinkage of Five Bulk-Fill Composite Resins in Comparison with a Conventional Composite Resin.
   Abbasi M, Moradi Z, Mirzaei M, Kharazifard MJ, Rezaei S.
   J Dent (Tehran). 2018 Nov;15(6):365-374.

3. A comparative study of bulk-fill composites: degree of conversion, post-gel shrinkage and cytotoxicity.
   Gonçalves F, Campos LMP, Rodrigues-Júnior EC, Costa FV, Marques PA, Francci CE, Braga RR, Boaro LCC.
   Braz Oral Res. 2018 Mar 8;32:e17. doi: 10.1590/1807-3107bor-2018.vol32.0017.

4. Evaluating the Marginal Integrity of Bulk Fill Fibre Reinforced Composites in Bio-mimetically Restored Tooth.
   Patnana AK, Vanga VNR, Chandrabhatla SK.
   J Clin Diagn Res. 2017 Jun;11(6):ZC24-ZC27. doi: 10.7860/JCDR/2017/27835.10049.

5. Local deformation fields and marginal integrity of sculptable bulk-fill, low-shrinkage and conventional composites.
   Miletic V, Peric D, Milosevic M, Manojlovic D, Mitrovic N.
   Dent Mater. 2016 Nov;32(11):1441-1451. doi: 10.1016/j.dental.2016.09.011.

6. Polymerization shrinkage kinetics and shrinkage-stress in dental resin-composites.
   Al Sunbul H, Silikas N, Watts DC.
   Dent Mater. 2016 Aug;32(8):998-1006. doi: 10.1016/j.dental.2016.05.006.

7. Mechanical properties, volumetric shrinkage and depth of cure of short fiber-reinforced resin composite.
   Tsujimoto A, Barkmeier WW, Takamizawa T, Latta MA, Miyazaki M.
   Dent Mater J. 2016;35(3):418-24. doi: 10.4012/dmj.2015-280.

8. Comparative Evaluation of Microleakage of Class II Cavities Restored with Different Bulk Fill Composite Restorative Systems: An In Vitro Study
   Pathik Patel, Manish Shah, Neha Agrawal, Priti Desai, Khyatiben Tailor, Khyati Patel.
   J Res Adv Dent 2016;5:2:52-62.

9. The effect of short fiber composite base on microleakage and load-bearing capacity of posterior restorations.
   Garoushi SK, Hatem M, Lassila LVJ, Vallittu PK.
   Acta Biomater Odontol Scand. 2015 Apr 14;1(1):6-12. doi: 10.3109/23337931.2015.1017576. eCollection 2015 Jan.

10. Microleakage of glass-ionomer, flowable composite, biodentine and fiber-reinforced base materials.
    Boutsiouki C, Tolidis K, Gerasimou P, Panagiotidou E.
    Dent Mater. 2014;30s:el-el80.

11. Physical properties and depth of cure of a new short fiber reinforced composite.
    Garoushi S, Säilynoja E, Vallittu PK, Lassila L.
    Dent Mater. 2013 Aug;29(8):835-41. doi: 10.1016/j.dental.2013.04.016.

12. Polymerization shrinkage of experimental short glass fiber-reinforced composite with semi-inter penetrating polymer network matrix.
    Garoushi S, Vallittu PK, Watts DC, Lassila LV.
    Dent Mater. 2008 Feb;24(2):211-5.

Depth of cure and light transmission of everX Posterior

Even though everX Posterior is not flowable and has a higher filler content than flowable bulk-fill materials, after 20 seconds of curing 4-mm thick specimens, everX Posterior showed bottom-to-top hardness ratios above 80%, which is clinically recommended.

1. Effect of exposure time and pre-heating on the conversion degree of conventional, bulk-fill, fiber reinforced and polyacid-modified resin composites.
   Lempel E, Öri Z, Szalma J, Lovász BV, Kiss A, Tóth Á, Kunsági-Máté S.
   Dent Mater. 2019 Feb;35(2):217-228.

2. Influences of short-fibre-reinforced resin composite thickness and curing time on its hardness and depth of cure.
   S Muchlisya, E Herda* and B Irawan
   IOP Conf. Series: Journal of Physics: Conf. Series 1073 (2018) 052004.

3. Curing characteristics of flowable and sculptable bulk-fill composites.
   Miletic V, Pongprueksa P, De Munck J, Brooks NR, Van Meerbeek B.
   Clin Oral Investig. 2017 May;21(4):1201-1212. doi: 10.1007/s00784-016-1894-0.

4. Influence of increment thickness on dentin bond strength and light transmission of composite base materials.
   Omran TA, Garoushi S, Abdulmajeed AA, Lassila LV, Vallittu PK.
   Clin Oral Investig. 2017 Jun;21(5):1717-1724. doi: 10.1007/s00784-016-1953-6.

5. Effect of short glass fibers on the polymerization shrinkage stress of dental composite.
   Shouha PSR, Ellakwa AE.
   J Biomed Mater Res B Appl Biomater. 2017 Oct;105(7):1930-1937. doi: 10.1002/jbm.b.33723.

6. Mechanical properties, volumetric shrinkage and depth of cure of short fiber-reinforced resin composite.
   Tsujimoto A, Barkmeier WW, Takamizawa T, Latta MA, Miyazaki M.
   Dent Mater J. 2016;35(3):418-24. doi: 10.4012/dmj.2015-280.

7. Influence of increment thickness on light transmission, degree of conversion and micro hardness of bulk fill composites.
   Garoushi S, Vallittu P, Shinya A, Lassila L.
   Odontology. 2016 Sep;104(3):291-7. doi: 10.1007/s10266-015-0227-0.

8. The Effect of Composition, Temperature and Post-Irradiation Curing of Bulk Fill Resin Composites on Polymerization Efficiency
   Dionysopoulosa D, Tolidisa K, Gerasimou P.
   Materials Research. 2016; 19(2): 466-473.

9. Viscoelastic properties, creep behavior and degree of conversion of bulk fill composite resins.
   Papadogiannis D, Tolidis K, Gerasimou P, Lakes R, Papadogiannis Y.
   Dent Mater. 2015 Dec;31(12):1533-41. doi: 10.1016/j.dental.2015.09.022.

10. Polymerization kinetics and impact of post polymerization on the Degree of Conversion of bulk-fill resin-composite at clinically relevant depth.
    Al-Ahdal K, Ilie N, Silikas N, Watts DC.
    Dent Mater. 2015 Oct;31(10):1207-13. doi: 10.1016/j.dental.2015.07.004.

11. Curing profile of bulk-fill resin-based composites.
    Li X, Pongprueksa P, Van Meerbeek B, De Munck J.
    J Dent. 2015 Jun;43(6):664-72. doi: 10.1016/j.jdent.2015.01.002.

12. Polymerization efficiency and flexural strength of low-stress restorative composites.
    Goracci C, Cadenaro M, Fontanive L, Giangrosso G, Juloski J, Vichi A, Ferrari M.
    Dent Mater. 2014 Jun;30(6):688-94. doi: 10.1016/j.dental.2014.03.006.

13. Physical properties and depth of cure of a new short fiber reinforced composite.
    Garoushi S, Säilynoja E, Vallittu PK, Lassila L.
    Dent Mater. 2013 Aug;29(8):835-41. doi: 10.1016/j.dental.2013.04.016.

14. Translucency of flowable bulk-filling composites of various thicknesses.
    Lassila LV, Nagas E, Vallittu PK, Garoushi S.
    Chin J Dent Res. 2012;15(1):31-5.

15. Depth of cure and surface microhardness of experimental short fiber-reinforced composite.
    Garoushi S, Vallittu PK, Lassila LV.
    Acta Odontol Scand. 2008 Feb;66(1):38-42. doi: 10.1080/00016350801918377.

Bonding performance of everX Posterior

The presence of protruding fibres and a thick oxygen inhibition layer on the surface of cured everX Posterior improves the shear bond strength to dentine and to the adjacent resin composite layer. This kind of micromechanical interlocking could lead to a more durable adhesion.

1. Bonding interface affects the load-bearing capacity of bilayered composites.
   Omran T, Garoushi S, Shinya A, Lassila L, Vallittu PK.
   Dent Mater J 2019; 38:1002-1011.

2. Original and Repair Bulk Fracture Resistance of Particle Filler and Short Fiber-Reinforced Composites.
   Bijelic-Donova J, Uctasli S, Vallittu PK, Lassila L.
   Oper Dent. 2018 Sep/Oct;43(5):E232-E242. doi: 10.2341/17-207-L.

3. Push-out bond strength of intra-orifice barrier materials: Bulk-fill composite versus calcium silicate cement.
   Özyurek T, Uslu G, Yilmaz K.
   J Dent Res Dent Clin Dent Prospects. 2018;12(1):6-11.

4. Evaluation of the effect of different post materials and adhesive systems on the bonding strength of short-post technique for primary teeth.
   Beldüz Kara N, Kanyilmaz T, Çankaya S, Kara C.
   Int J Paediatr Dent. 2018 Mar;28(2):239-248. doi: 10.1111/ipd.12347.

5. Influence of increment thickness on dentin bond strength and light transmission of composite base materials.
   Omran TA, Garoushi S, Abdulmajeed AA, Lassila LV, Vallittu PK.
   Clin Oral Investig. 2017 Jun;21(5):1717-1724. doi: 10.1007/s00784-016-1953-6.

6. Bond strength of fiber posts and short fiber-reinforced composite to root canal dentin following cyclic loading.
   Emre Nagas, Isil Cekic-Nagas, Ferhan Egilmez, Gulfem Ergun, Pekka K. Vallittu & Lippo V. J. Lassila Journal of Adhesion Science and Technology 2017; 31:1397-1407.

7. Bonding performance and interfacial characteristics of short fiber-reinforced resin composite in comparison with other composite restoratives.
   Tsujimoto A, Barkmeier WW, Takamizawa T, Latta MA, Miyazaki M.
   Eur J Oral Sci. 2016 Jun;124(3):301-8. doi: 10.1111/eos.12262.

8. Comparison of Shear Bond Strength and Microleakage of Various Bulk-fill Bioactive Dentin substitutes: An in vitro Study.
   Alkhudhairy FI, Ahmad ZH.
   J Contemp Dent Pract. 2016 Dec 1;17(12):997-1002.

9. Relationship between mechanical properties and bond durability of short fiber-reinforced resin composite with universal adhesive.
   Tsujimoto A, Barkmeier WW, Takamizawa T, Watanabe H, Johnson WW, Latta MA, Miyazaki M.
   Eur J Oral Sci. 2016 Oct;124(5):480-489. doi: 10.1111/eos.12291.

10. Oxygen inhibition layer of composite resins: effects of layer thickness and surface layer treatment on the interlayer bond strength.
    Bijelic-Donova J, Garoushi S, Lassila LV, Vallittu PK.
    Eur J Oral Sci. 2015 Feb;123(1):53-60. doi: 10.1111/eos.12167. Epub 2014 Dec 31.

11. Effect of storage time on microtensile bond strength of short glass fiber-reinforced composite.
    Garoushi S, Vallittu PK, Lassila LVJ.
    The Chinese Journal of Dental Research. 2007; 10:7-10.

Loading performance of everX Posterior restorations

A biomimetic composite structure is a restoration that includes both everX Posterior as bulk base (dentine replacing material) and a conventional resin composite (to replace enamel). Several studies have shown that teeth restored with a biomimetic approach using everX Posterior as base exhibited superior fracture resistance and a favourable failure mode. They showed that everX Posterior supports the remaining tooth structure and composite restoration by serving as a crack-preventing layer.

1. Performance of fibre reinforced composite as a post-endodontic restoration on different endodontic cavity designs— an in-vitro study.
   Shah S, Shilpa-Jain DP, Velmurugan N, Sooriaparkas C, Krithikadatta J.
   J Mech Behav Biomed Mater 2020; 104:103650.

2. Direct bilayered biomimetic composite restoration: The effect of a cusp-supporting short fiber-reinforced base design on the chewing fracture resistance and failure mode of molars with or without endodontic treatment.
   Bijelic-Donova J, Keulemans F, Vallittu PK, Lassila L.
   J Mech Behav Biomed Mater 2020:103:103554.

3. Fracture behavior of root-amputated teeth at different amount of periodontal support - a preliminary in vitro study.
   Szabó B, Garoushi S, Braunitzer G, Szabó P B, Baráth Z, Fráter M.
   BMC Oral Health 2019;19(1):261.

4. Fracture behaviour of MOD restorations reinforced by various fibre reinforced techniques – An in vitro study
   Sáry T, Garoushi S, Braunitzer G , Alleman D, Volom A , Fráter M.
   J Mech Behav Biomed Mater 2019;98:348-356.

5. Evaluation of Fracture Resistance of Endodontically Treated Maxillary Premolars Restored with Three Different Core Materials: An In Vitro Study
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Picture: courtesy of Dr. Lassila, University of Turku, Finland

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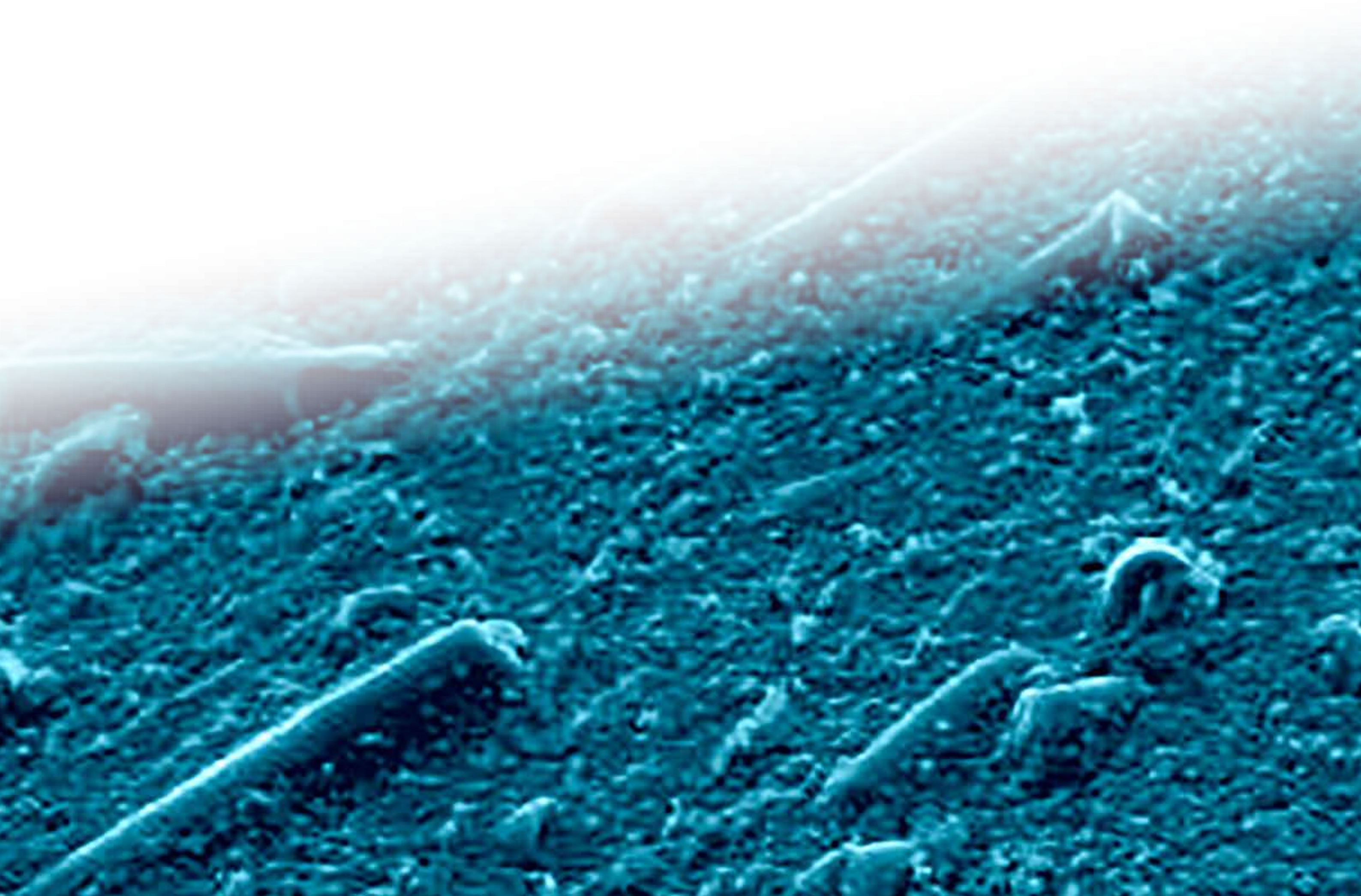

Optical and other surface properties of everX Posterior

The colour of the bilayered restorations of everX Posterior and capped conventional composite is mostly similar to corresponding mono-composite restorations irrespective of shade and layer thickness. everX Posterior also showed an S. mutans adhesion similar to that of other commercial restorative materials.

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Flowable fibre-reinforced composite (everX Flow)

As explained previously, the fibre aspect ratio, interfacial adhesion between fibres and matrix and the fibre load are of crucial importance for an efficient reinforcement. Studies have shown that the short fibre-reinforced flowable resin composite everX Flow exhibited significantly higher fracture toughness and flexural strength compared to conventional composites. It may be used efficiently as a dentine replacement in stress bearing areas.

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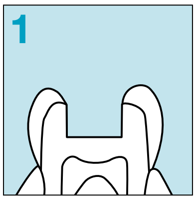
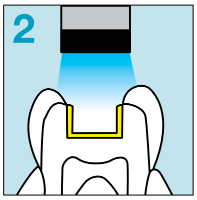
Technique Guide everX Flow

Direct restorations



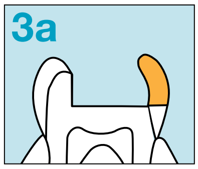
Prepare cavity.

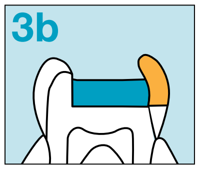


Bond and light-cure.

Place everX Flow; leave sufficient space for the overlaying composite.

Class II and large cavities



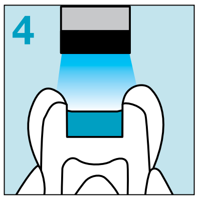


Build first the missing walls using a conventional light-cured restorative composite. The wall should be thick enough to withstand the application pressure of everX Flow.

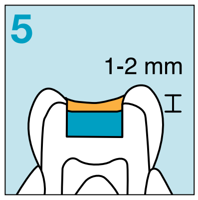
Irradiation Time and Effective Depth of Cure

Shade \ Irradiation time	10 sec. (High Power LED) (>1200 mW/cm²) 20 sec. (Halogen/ LED) (>700 mW/cm²)
Bulk shade	5.5 mm
Dentin shade	2.0 mm

The Bulk shade can be placed using a bulk filling technique (up to 5.5mm). The Dentin shade should be placed and light-cured in layers of 2.0mm.

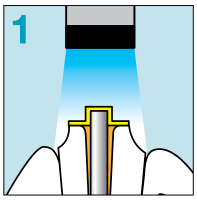


Light-cure.

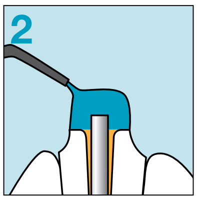


Cover with composite.

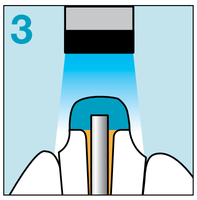
Core build-up



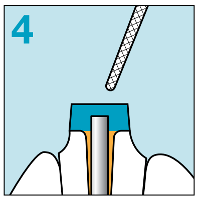
Prepare the surfaces to be bonded. Bond and light-cure.



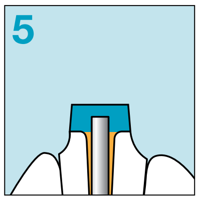
Use everX Flow to build the core.



Light-cure.



Contour & finish the core.



Final core build-up preparation.

Irradiation Time and Effective Depth of Cure

Shade \ Irradiation time	10 sec. (High Power LED) (>1200 mW/cm²) 20 sec. (Halogen/ LED) (>700 mW/cm²)
Bulk shade	5.5 mm
Dentin shade	2.0 mm

The final indirect restoration should fully cover the everX Flow core build-up.

Notes

Discover more on Youtube!

https://www.youtube.com/user/GCEuropeProducts/search?query=everX

Check our App!

Restorative Dentistry Guides

In GC's Restorative Dentistry Guides, you can find more information regarding the use of everX products as well as other restorative materials, together with step-by-step procedures and technique tips!

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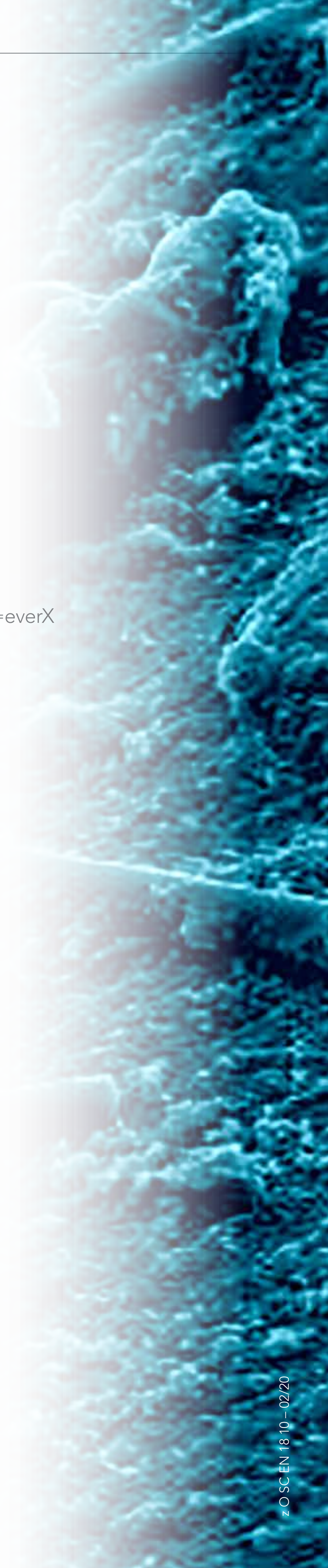

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