

1. A systematic review of the 5-year survival and complication rates of implant-supported single crowns. Jung RE, Pjetursson BE, Glauser R, Zembic A, Zwahlen M, Lang NP. Clin Oral Implants Res. 2008 Feb;19(2):119-30. Epub 2007 Dec 7. Review. PMID: 18067597
2. A systematic review of the survival and complication rates of implant-supported fixed dental prostheses (FDPs) after a mean observation period of at least 5 years. Pjetursson BE, Thoma D, Jung R, Zwahlen M, Zembic A. Clin Oral Implants Res. 2012 Oct;23 Suppl 6:22-38. doi: 10.1111/j.1600-0501.2012.02546.x. Review. PMID: 23062125
3. Implant survival and complications. The Third EAO consensus conference 2012. Albrektsson T, Donos N; Working Group 1. Clin Oral Implants Res. 2012 Oct;23 Suppl 6:63-5. doi: 10.1111/j.1600-0501.2012.02557.x. Review. PMID: 23062128
4. https://www.bzaek.de/fileadmin/PDFs/dms/Zusammenfassung_DMS_V.pdf
5. THOMAS H. SULZER, MICHAEL M. BORNSTEIN und DANIEL BUSER. Klinik für Oralchirurgie und Stomatologie, Zahnmedizinische Kliniken der Universität Bern. Schweiz Monatsschr Zahnmed 114: 444–450 (2004)
6. Combined tooth-implant-supported telescopic prostheses in a midterm follow-up of > 2 years. Joda T. Int J Prosthodont. 2013 Nov-Dec;26(6):536-40. doi: 10.11607/ijp.3289. PMID: 24179966
7. Clinical and experimental bone changes after intraosseous implantation. Murphy WM. J Prosthet Dent. 1995 Jan;73(1):31-5. Review.
8. <https://www.konsensuskonferenz-implantologie.eu/indikationsklassen-fuer-implantatversorgung-zur-regelversorgung/>
9. Screw-versus cement-retained implant prostheses: a systematic review of prosthodontic maintenance and complications. Ma S, Fenton A. Int J Prosthodont. 2015 Mar-Apr;28(2):127-45. doi: 10.11607/ijp.3947. Review. PMID: 25822297
10. "Peri-Implantitis": A Complication of a Foreign Body or a Man-Made "Disease". Facts and Fiction. Albrektsson T, Canullo L, Cochran D, De Bruyn H. Clin Implant Dent Relat Res. 2016 Aug;18(4):840-9. doi: 10.1111/cid.12427. Epub 2016 May 30. Review. PMID: 27238274
11. Evaluation of cement-retained versus screw-retained implant-supported restorations for marginal bone loss: A systematic review and meta-analysis. Lemos CA, de Souza Batista VE, Almeida DA, Santiago Júnior JF, Verri FR, Pellizzer EP. J Prosthet Dent. 2016 Apr;115(4):419-27. doi: 10.1016/j.prosdent.2015.08.026. Epub 2015 Nov 14. Review. PMID: 26589441
12. Excess cement and the risk of peri-implant disease - a systematic review. Staubli N, Walter C, Schmidt JC, Weiger R, Zitzmann NU. Clin Oral Implants Res. 2017

Oct;28(10):1278-1290. doi: 10.1111/clr.12954. Epub 2016 Sep 19. Review. PMID: 27647536

13. Improvements in implant dentistry over the last decade: comparison of survival and complication rates in older and newer publications. Pjetursson BE, Asgeirsson AG, Zwahlen M, Sailer I. Int J Oral Maxillofac Implants. 2014;29 Suppl:308-24. doi: 10.11607/jomi.2014suppl.g5.2. Review. PMID: 24660206

- [1] Al-Harbi F, Kaisarly D, Bader D, El Gezawi M: Marginal integrity of bulk versus incremental fill Class II composite restorations. *Oper Dent* 41, 146–156 (2016).
- [2] Al Shaafi Haenel T, Sullivan B, Labrie D, Alqahtani MQ, Price RB: Effect of a broad-spectrum LED curing light on the Knoop microhardness of four posterior resin based composites at 2, 4 and 6-mm depths. *J Dent* 45, 14–18 (2016).
- [3] Assis FS, Lima SNL, Tonetto MR, Bhandi SH, Pinto SCS, Malaquias P, Loguercio AD, Bandéca MC: Evaluation of bond strength, marginal integrity, and fracture strength of bulk- vs incrementally-filled restorations. *J Adhes Dent* 18, 317–323 (2016).
- [4] Benetti AR, Havndrup-Pedersen C, Honoré D, Pedersen M, Pallesen U: Bulk-fill resin composites: polymerization contraction, depth of cure, and gap formation. *Oper Dent* 40, 190–200 (2015).
- [5] Bortoluzzi EA, Niu LN, Palani CD et al.: Cytotoxicity and osteogenic potential of silicate calcium cements as potential protective materials for pulpal revascularization. *Dent Mater* 31, 1510–1522 (2015).
- [6] Buchalla W, Lennon AM: Die fluoreszenzunterstützte Kariesexkavation – Funktionsprinzip und Empfehlungen für den Gebrauch. *Oralprophylaxe und Kinderzahnheilkunde* 35, 162–173 (2013).
- [7] Camilleri J, Laurent P, About I: Hydration of biodentine, Theracal LC, and a prototype tricalcium silicate-based dentin replacement material after pulp capping in entire tooth cultures. *J Endod* 40, 1846–1854 (2014).
- [8] Cao Y, Bogen G, Lim J, Shon WJ, Kang MK: Bioceramic materials and the changing concepts in vital pulp therapy. *J Calif Dent Assoc* 44, 278–290 (2016).
- [9] Campos EA, Ardu S, Lefever D, Jassé FF, Bortolotto T, Krejci I: Marginal adaptation of Class II cavities restored with bulk-fill composites. *J Dent* 42, 575–581 (2014).
- [10] Chen C, Niu LN, Xie H, Zhang ZY, Zhou LQ, Jiao K, Chen JH, Pashley DH, Tay FR: Bonding of universal adhesives to dentine – old wine in new bottles? *J Dent* 43, 525–536 (2015).
- [11] Dammaschke T: Dentin- und Hartgewebsneubildung nach Überkappung der Pulpa. *zm* 107 (18), 2084–2094 (2017).
- [12] El-Damanhoury H, Platt J: Polymerization shrinkage stress kinetics and related properties of bulk-fill resin composites. *Oper Dent* 39, 374–382 (2013).
- [13] Ernst CP: Neuversorgung eines insuffizienten Goldinlays. *ZMK* 32, 846–848 (2016).
- [14] Ernst CP: Vom Gold-Standard zur Gold-Alternative. *ZMK* 31, 214–226 (2015).
- [15] Flury S, Hayoz S, Peutzfeldt A, Hüsler J, Lussi A: Depth of cure of resin composites: is the ISO 4049 method suitable for bulk fill materials? *Dent Mater* 28, 521–528 (2012).
- [16] Frankenberger R, Hehn J, Hajto N, Krämer N, Naumann M, Koch A, Roggendorf MJ: Effect of proximal box elevation with resin composite on marginal quality of resin composite inlays in vitro. *Clin Oral Investig* 17, 177–183 (2013).

- [17] Fronza BM, Rueggeberg FA, Braga RR, Mogilevych B, Soares LE, Martin AA, Ambrosano G, Giannini M: Monomer conversion, microhardness, internal marginal adaptation, and shrinkage stress of bulk-fill resin composites. *Dent Mater* 31, 1542–1551 (2015).
- [18] Furness A, Tadros MY, Looney SW, Rueggeberg FA: Effect of bulk/incremental fill on internal gap formation of bulk-fill composites. *J Dent* 42, 439–449 (2014).
- [19] Garcia D, Yaman P, Dennison J, Neiva G: Polymerization shrinkage and depth of cure of bulk fill flowable composite resins. *Oper Dent* 39, 441–448 (2014).
- [20] Garoushi S, Vallittu P, Shinya A, Lassila L: Influence of increment thickness on light transmission, degree of conversion and micro hardness of bulk fill composites. **Quelle?**
- [21] Heintze SD, Monreal D, Peschke A: Marginal quality of class II composite restorations placed in bulk compared to an incremental technique: evaluation with SEM and stereomicroscope. *J Adhes Dent* 17, 147–154 (2015).
- [22] Hirata R, Clozza E, Giannini M, Farrokhmanesh E, Janal M, Tovar N, Coelho PG: Shrinkage assessment of low shrinkage composites using micro-computed tomography. *J Biomed Mater Res B Appl Biomater*, 1–9 (2014).
- [23] Ilgenstein I, Zitzmann NU, Bühler J, Wegehaupt FJ, Attin T, Weiger R, Krastl G: Influence of proximal box elevation on the marginal quality and fracture behavior of root-filled molars restored with CAD/CAM ceramic or composite onlays. *Clin Oral Investig* 19, 1021–1028 (2015).
- [24] Ilie N, Hickel R: Investigations on a methacrylate-based flowable composite based on the SDR technology. *Dent Mater* 27, 348–355 (2011).
- [25] Jang JH, Park SH, Hwang IN: Polymerization shrinkage and depth of cure of bulk-fill resin composites and highly filled flowable resin. *Oper Dent* 40, 172–180 (2015).
- [26] Kalmowicz J, Phebus JG, Owens BM, Johnson WW, King GT: Microleakage of class I and II composite resin restorations using a sonic-resin placement system. *Oper Dent* 40, 653–661 (2015).
- [27] Karaman E, Keskin B, Inan U: Three-year clinical evaluation of class II posterior composite restorations placed with different techniques and flowable composite linings in endodontically treated teeth. *Clin Oral Invest* 21, 709–716 (2017).
- [28] Kapoor N, Bahuguna N, Anand S: Influence of composite insertion technique on gap formation. *J Conserv Dent* 19, 77–81 (2016).
- [29] Kim HJ, Park SH: Measurement of the internal adaptation of resin composites using micro-CT and its correlation with polymerization shrinkage. *Oper Dent* 39, E57–70 (2014).
- [30] Kim RJY, Kim YJ, Choi NS, Lee I-B: Polymerization shrinkage, modulus, and shrinkage stress related to tooth-restoration interfacial debonding in bulk-fill composites. *J Dent* 43, 430–439 (2015).
- [31] Krejci I, Lutz F, Reimer M: Marginal adaptation and fit of adhesive ceramic inlays. *J Dent* 21, 39–46 (1993).
- [32] Kumagai RY, Zeidan LC, Rodrigues JA, Reis AF, Roulet JF: Bond strength of a flowable bulk-fill resin composite in class II MOD cavities. *J Adhes Dent* 17, 427–432 (2015).
- [33] Li X, Pongprueksa P, Van Meerbeek B, De Munck J: Curing profile of bulk-fill resin-based composites. *J Dent* 43, 664–672 (2015).

- [34] Magne P, Spreafico RC: Deep margin elevation: a paradigm shift. *Am J Esthet Dent* 2, 86–96 (2012).
- [35] Manhart, J, Chen H, Hamm, G, Hickel R: Buonocore Memorial Lecture. Review of the clinical survival of direct and indirect restorations in posterior teeth of the permanent dentition. *Oper Dent* 29, 481–508 (2004).
- [36] Manhart J, Chen HY, Hickel R: Clinical evaluation of the posterior composite Quixfil in class I and II cavities: 4-year follow-up of a randomized controlled trial. *J Adhes Dent* 12, 237–243 (2010).
- [37] Marovic D, Tauböck TT, Attin T, Panduric V, Tarle Z: Monomer conversion and shrinkage force kinetics of low-viscosity bulk-fill resin composites. *Acta Odontol Scand* 73, 474–480 (2014).
- [38] Miletic V, Pongprueksa P, De Munck J, Brooks NR, Van Meerbeek B: Curing characteristics of flowable and sculptable bulk-fill composites. *Clin Oral Invest* 21, 1201–1212 (2017).
- [39] Moraschini V, Fai CK, Alto RM, Dos Santos GO: Amalgam and resin composite longevity of posterior restorations: a systematic review and meta-analysis. *J Dent* 43, 1043–1050 (2015).
- [40] Nazari A, Sadr A, Saghiri MA, Campillo-Funollet M, Hamba H, Shimada Y, Tagami J, Sumi Y: Non-destructive characterization of voids in six flowable composites using swept-source optical coherence tomography. *Dent Mater* 29, 278–286 (2013).
- [41] 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* 15, 237–243 (2013).
- [42] Nowicka A, Lipski M, Parafiniuk M et al.: Response of human dental pulp capped with biodentine and mineral trioxide aggregate. *J Endod* 39, 743–747 (2013).
- [43] Ozel E, Tuna EB, Firatli E: The effects of cavity-filling techniques on microleakage in class II resin restorations prepared with Er:YAG laser and diamond bur: a scanning electron microscopy study. *Scanning* 38, 389–395 (2016).
- [44] Poggio C, Chiesa M, Scribante A, Mekler J, Colombo M: Microleakage in class II composite restorations with margins below the CEJ: In vitro evaluation of different restorative techniques. *Med Oral Patol Oral Cir Bucal* 18, 793–798 (2013).
- [45] Papadogiannis D, Tolidis K, Gerasimou P, Lakes R, Papadogiannis Y: Viscoelastic properties, creep behavior and degree of conversion of bulk fill composite resins. *Dent Mater* 31, 1533–1541 (2015).
- [46] Roggendorf MJ, Krämer N, Appelt A, Naumann M, Frankenberger R: Marginal quality of flowable 4-mm base vs. conventionally layered resin composite. *J Dent* 39, 643–647 (2011).
- [47] Roggendorf MJ, Krämer N, Dippold C, Vosen VE, Naumann M, Jablonski-Momeni A, Frankenberger R: Effect of proximal box elevation with resin composite on marginal quality of resin composite inlays in vitro. *J Dent* 40, 1068–1073 (2012).
- [48] Rosa WL, Piva E, Silva AF: Bond strength of universal adhesives: a systematic review and meta-analysis. *J Dent* 43, 765–776 (2015).
- [49] Rosatto CMP, Bicalho AA, Veríssimo C, Bragança GF, Rodrigues MP, Tantbirojn D, Versluis A, Soares CJ: Mechanical properties, shrinkage stress, cuspal strain and fracture

resistance of molars restored with bulk-fill composites and incremental filling technique. *J Dent* 43, 1519–1528 (2015).

[50] Rullmann I, Schattenberg A, Marx M, Willershausen B, Ernst C-P: Photoelastic determination of polymerization shrinkage stress in low-shrinkage resin composites. *Schweiz Monatsschr Zahnmed* 22, 294–299 (2012).

[51] Rullmann I: Pulpaüberkappung: Untersuchungen zur Wirksamkeit von TheraCal LC. *ZMK* 30 (3), 122–133 (2014).

[52] Schwendicke F, Göstemeyer G, Blunck U, Paris S, Hsu LY, Tu YK: Directly placed restorative materials: review and network meta-analysis. *J Dent Res* 95, 613–622 (2016).

[53] Scotti N, Comba A, Gambino A, Paolino DS, Alovise M, Pasqualini D, Berutti E: Microleakage at enamel and dentin margins with a bulk fills flowable resin. *Eur J Dent* 8, 1–8 (2014).

[54] Scotti N, Alovise C, Comba A, Ventura G, Pasqualini D, Grignolo F, Berutti E: Evaluation of composite adaptation to pulpal chamber floor using optical coherence tomography. *J Endod* 42, 160–163 (2016).

[55] Son S-A, Park J-K, Seo D-G, Ko C-C, Kwon YH: How light attenuation and filler content affect the microhardness and polymerization shrinkage and translucency of bulk-fill composites? *Clin Oral Invest* 21, 559–565 (2017).

[56] Takamizawa T, Barkmeier WW, Tsujimoto A, Scheidel DD, Watanabe H, Erickson RL, Latta MA, Miyazaki M: Influence of water storage on fatigue strength of self-etch adhesives. *J Dent* 43, 1416–1427 (2015).

[57] van Dijken JW, Pallesen U: Posterior bulk-filled resin composite restorations: a 5-year randomized controlled clinical study. *J Dent* 51, 29–35 (2016).

[58] van Dijken JW, Pallesen U: Bulk-filled posterior resin restorations based on stress decreasing resin technology: a randomized, controlled 6-year evaluation. *Eur J Oral Sci* 125, 303–309 (2017).

[59] Van Ende A, De Munck J, Lise DP, Van Meerbeek B: Bulk-fill composites: a review of the current literature. *J Adhes Dent* 9, 95–109 (2017).

[60] Zaruba M, Göhring TN, Wegehaupt FJ, Attin RT: Influence of a proximal margin elevation technique on marginal adaptation of ceramic inlays. *Acta Odontol Scand* 71, 317–324 (2013).

[61] Zorzin J, Maier E, Harre S, Fey T, Belli R, Lohbauer U, Petschelt A, Taschner M: Bulk-fill resin composites: polymerization properties and extended light curing. *Dent Mater* 31, 293–301 (2015).

- [1] Hassel A: Pilotuntersuchung: Fehler bei der Farbnahme kosten Zeit und Geld. ZMK aktuell, 08.03.2013.
- [2] Gürel G: The science and art of porcelain laminate veneers. London, Chicago: Quintessence Publishing Co. Ltd. (2003).
- [3] Paravina RD, O'Neill PN, Swift EJ, Nathanson D, Goodacre CJ: Teaching of color in predoctoral and postdoctoral dental education in 2009. J Dent 38, 34–40 (2010).
- [4] Öngül D, Şermet B, Balkaya MC: Visual and instrumental evaluation of color match ability of 2 shade guides on a ceramic system. J Prosthet Dent 108 (1), 9–14 (2012).
- [5] Samra APB, Moro MG, Mazur RF, Vieira S, De Souza EM, Freire A, Rached RN: Performance of dental students in shade matching: impact of training. J Esthet Restor Dent 29 (2), E24–E32 (2017). Epub 29.3.2017.
- [6] Faber FJ, Schlegel G: Visuelle und messtechnische Zuordnung der Zahnfarbe. Dtsch Zahnärztl Z 50, 661 (1995).
- [7] Bratner S: Visuelle Zahnfarbbestimmung trotz Farbsehschwäche? Ergebnisse eigener Untersuchungen. In: Thiery J, Beck-Sickinger AG, Arendt T (Hrsg.): 12th Leipzig Research Festival for Life Sciences 2013, Abstract Book, 220 (2013).
- [8] Hannak WB, Jakstat H, Klinke T, Böning K, Pirek P, Beuer F: Reproducibility and accuracy of measuring results of VITA Easyshade Advance. J Dent Res 95 (Spec Iss A), C1596 (2016).
- [9] Da Silva JD, Park SE, Weber HP, Ishikawa-Nagai S: Clinical performance of a newly developed spectrophotometric system on tooth color reproduction. J Prosthet Dent 99 (5), 361–368 (2008).

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Teilmatrizensystem für zuverlässige Klasse-II-Restaurationen

Christian Ehrensberger

- [1] DentalTown (2012). Restorative Dentistry. Monthly Poll: What is the most challenging part of a Class II Restoration?
- [2] Lussi A: Verletzung der Nachbarzähne bei der Präparation approximaler Kavitäten. Schweiz Monatsschr Zahnmed 105 (10), 1259-1264 (1995).
- [3] Moopnar M, Faulkner KDB: Accidental damage to teeth adjacent to crown abutment teeth. Aust Dent J 36 (2), 136-140 (1991).
- [4] v Quist V, Johannessen L, Bruun M: Progression of approximal caries in relation to iatrogenic preparation damage. J Dent Res 71 (7), 1370-1373 (1992).
- [5] Lussi A, Gygax M: Iatrogenic damage to adjacent teeth during classical approximal box preparation. J Dent 26 (5-6), 435-441 (1998).
- [6] Firla MTh: Tofflemire-Ringmatrizensysteme: Einmalartikel vs. Mehrfachverwendung. ZWP (7+8), 74-76 (2016).
- [7] Snyder T: Klasse-II-Kompositfüllungen: Die Widerstandsfähigkeit reproduzieren. DZW 47, 18-18 (2017).
- [8] Dao J: Teilmatrizensystem erleichtert Zahnrestaurationen. ZMK, https://www.zmk-aktuell.de/fachgebiete/zahnerhaltung/story/teilmatrizensystem-erleichtert-zahnrestaurationen__5028.html Zugriff am 25.1.2018)
- [9] Ganter P: Mehr Effizienz bei Seitenzahnversorgungen. ZWP (9), 102-105 (2012).
- [10] L. Hermeler: Palodent Plus Teilmatrizensystem: „Der Ring der Ringe.“ ZMK, 2013; 29(6): 412-415