

## LITERATUR ZMK 5 2024

ZMK 2024; 40 (5) S. 239

Prof. Dr. Claus-Peter Ernst

Editorial: In aller Munde: Bisphenol A

- [1] <https://www.test.de/BPA-in-Konserven-Die-Dose-hat-ein-Problem-6110181-0/>
- [2] <https://www.umweltbundesamt.de/sites/default/files/medien/publikation/long/3782.pdf>
- [3] <https://www.eurekalert.org/news-releases/692425>
- [4] <https://www.efsa.europa.eu/en/efsjournal/pub/6857>
- [5] <https://www.bfr.bund.de/cm/343/bisphenol-a-bfr-schlaegt-gesundheitsbasierten-richtwert-vor-fuer-eine-vollstaendige-risikobewertung-werden-aktuelle-expositionsdaten-benoetigt.pdf>
- [6] <https://www.efsa.europa.eu/sites/default/files/2023-04/bfr-efsa-art-30.pdf>
- [7] <https://www.bmel.de/SharedDocs/Pressemitteilungen/DE/2024/012-bisphenol-a.html>
- [8] <https://www.quintessence-publishing.com/deu/de/news/zahnmedizin/restorative-zahnheilkunde/biokompatibilitaet-amalgam-versus-komposit>
- [9] Schill H, Graeser P, Bücher K, Pfisterer J, Khazaei Y, Enggist L, Hickel R, Kühnisch J. Clinical performance of a new fissure sealant-results from a 2-year randomized clinical trial. Clin Oral Investig 2022; 26: 5471-5480.
- [10] Marzouk T, Sathyaranayana S, Kim AS, Seminario AL, McKinney CM. A Systematic Review of Exposure to Bisphenol A from Dental Treatment. JDR Clin Trans Res 2019; 4(2):106-115.
- [11] Schmalz G, Widbiller M. Biokompatibilität zahnärztlicher Werkstoffe – Update 2018. Zahnmedizin up2date 2018; 12: 239–256.
- [12] Tichy A, Simkova M, Vrbova R, Roubickova A, Duskova M, Bradna P. Bisphenol A Release from Dental Composites and Resin-Modified Glass Ionomers under Two Polymerization Conditions. Polymers (Basel) 2021; 23;14(1):46.

---

ZMK 2024; 40 (5) S. 242-247

Dr. Charlotte Raabe, Prof. Dr. Michael Hülsmann

Die Kanalmorphologie von Unterkiefer-Prämolaren

- [1] Iqbal A. The factors responsible for endodontic treatment failure in the permanent dentitions of the patients reported to the College of Dentistry, the University of Aljouf, Kingdom of Saudi Arabia. J Clin Diagn Res. 2016; 10: 146-148.
- [2] Sagale AA, Ramugade MM, Ganga R. Endodontic management of mandibular second premolar with type ix canal configuration using cone-beam computed tomography as a diagnostic aid: A rare case report. Contemp Clin Dent. 2018; 9: 180-184.
- [3] Bürklein S, Heck R, Schäfer E. Evaluation of the root canal anatomy of maxillary and mandibular premolars in a selected German population using cone-beam computed tomographic data. J Endod. 2017; 43: 1448-1452.

- [4] Slowey RR. Root canal anatomy. Road map to successful endodontics. *Dent Clin North Am.* 1979; 23: 555-573.
  - [5] Cleghorn BM, Christie WH, Dong CC. The root and root canal morphology of the human mandibular first premolar: A literature review. *J Endod.* 2007; 33: 509-516.
  - [6] Vertucci FJ. Root canal morphology of mandibular premolars. *J Am Dent Assoc.* 1978; 97: 47-50.
  - [7] Abraham SB, Gopinath VK. Root canal anatomy of mandibular first premolars in an emirati subpopulation: A laboratory study. *Eur J Dent.* 2015; 9: 476-482.
  - [8] Rapsch H, Paquè F. Diagnostik und Instrumentierung lingualer Kanalabzweigungen in ersten Unterkieferprämolaren. *Endodontie* 2017; 26: 155-164.
  - [9] Jang YE, Kim Y, Kim B, et al. Frequency of non-single canals in mandibular premolars and correlations with other anatomical variants: An in vivo cone beam computed tomography study. *BMC Oral Health* 2019; 19: 272.
  - [10] Vertucci FJ. Root canal anatomy of the human permanent teeth. *Oral Surg Oral Med Oral Pathol* 1984; 58: 589-599.
  - [11] Ahmed HMA, Versiani MA, De-Deus G, Dummer PMH. A new system for classifying root and root canal morphology. *Int Endod J.* 2017; 50: 761-770.
  - [12] Nallapati S. Three canal mandibular first and second premolars: A treatment approach. *J Endod.* 2005; 31: 474-476.
  - [13] England MC, Hartwell GR, Lance JR. Detection and treatment of multiple canals in mandibular premolars. *J Endod.* 1991; 17: 174-178.
  - [14] Arnold M. Die Anatomie von Unterkiefer-Prämolaren (Wurzelkanalsysteme Teil 6). zm 2018.
  - [15] Hülsmann M. Das Auffinden zusätzlicher Wurzelkanäle. *Schweiz Monatsschr.* 1992; 102: 84-90.
  - [16] Hülsmann M. Prämolaren mit drei Wurzelkanälen: Inzidenz, Diagnostik und Therapie. *Endodontie* 1994; 3: 277-288.
- 

#### **ZMK 2024; 40 (5) S. 248-257**

**PD Dr. Andreas Keßler M.Sc.**

**Die Endoteilkrone – ein Update**

1. Saunders, W.P. and E.M. Saunders, Coronal leakage as a cause of failure in root-canal therapy: a review. *Endod Dent Traumatol*, 1994. 10(3): p. 105-8.
2. Mannocci, F. and J. Cowie, Restoration of endodontically treated teeth. *Br Dent J*, 2014. 216(6): p. 341-6.
3. Papa, J., C. Cain, and H.H. Messer, Moisture content of vital vs endodontically treated teeth. *Endod Dent Traumatol*, 1994. 10(2): p. 91-3.
4. Sedgley, C.M. and H.H. Messer, Are endodontically treated teeth more brittle? *J Endod*, 1992. 18(7): p. 332-5.
5. Dietschi, D., et al., Biomechanical considerations for the restoration of endodontically treated teeth: a systematic review of the literature, Part II (Evaluation of fatigue behavior, interfaces, and in vivo studies). *Quintessence Int*, 2008. 39(2): p. 117-29.

6. Lin, C.L., Y.H. Chang, and P.R. Liu, Multi-factorial analysis of a cusp-replacing adhesive premolar restoration: A finite element study. *J Dent*, 2008. 36(3): p. 194-203.
7. Reeh, E.S., H.H. Messer, and W.H. Douglas, Reduction in tooth stiffness as a result of endodontic and restorative procedures. *J Endod*, 1989. 15(11): p. 512-6.
8. Sarkis-Onofre, R., et al., Cast metal vs. glass fibre posts: a randomized controlled trial with up to 3 years of follow up. *J Dent*, 2014. 42(5): p. 582-7.
9. Rardown, K. and P.O. Glantz, On cantilever loading of vital and non-vital teeth. An experimental clinical study. *Acta Odontol Scand*, 1986. 44(5): p. 271-7.
10. Deliperi, S., Clinical evaluation of nonvital tooth whitening and composite resin restorations: five-year results. *Eur J Esthet Dent*, 2008. 3(2): p. 148-59.
11. von Stein-Lausnitz, M., et al., Direct restoration of endodontically treated maxillary central incisors: post or no post at all? *Clin Oral Investig*, 2019. 23(1): p. 381-389.
12. Balto, K., Tooth survival after root canal treatment. *Evid Based Dent*, 2011. 12(1): p. 10-1.
13. Adolphi, G., et al., Direct resin composite restorations in vital versus root-filled posterior teeth: a controlled comparative long-term follow-up. *Oper Dent*, 2007. 32(5): p. 437-42.
14. Naumann, M., et al., "Ferrule Comes First. Post Is Second!" Fake News and Alternative Facts? A Systematic Review. *J Endod*, 2018. 44(2): p. 212-219.
15. Marchionatti, A.M.E., et al., Clinical performance and failure modes of pulpless teeth restored with posts: a systematic review. *Braz Oral Res*, 2017. 31: p. e64.
16. Baba, N.Z. and C.J. Goodacre, Restoration of endodontically treated teeth: contemporary concepts and future perspectives. *Endodontic Topics*, 2014. 31(1): p. 68-83.
17. Soares, C.J., et al., Influence of the endodontic treatment on mechanical properties of root dentin. *J Endod*, 2007. 33(5): p. 603-6.
18. Figueiredo, F.E.D., P.R.S. Martins-Filho, and A.L. Faria-e-Silva, Do metal post-retained restorations result in more root fractures than fiber post-retained restorations? A systematic review and meta-analysis. *Journal of endodontics*, 2015. 41(3): p. 309-316.
19. Naumann, M., et al., Dentin-like versus rigid endodontic post: 11-year randomized controlled pilot trial on no-wall to 2-wall defects. *Journal of Endodontics*, 2017. 43(11): p. 1770-1775.
20. Rasimick, B.J., et al., A review of failure modes in teeth restored with adhesively luted endodontic dowels. *J Prosthodont*, 2010. 19(8): p. 639-46.
21. Libman, W.J. and J.I. Nicholls, Load fatigue of teeth restored with cast posts and cores and complete crowns. *Int J Prosthodont*, 1995. 8(2): p. 155-61.
22. Pissis, P., Fabrication of a metal-free ceramic restoration utilizing the monobloc technique. *Pract Periodontics Aesthet Dent*, 1995. 7(5): p. 83-94.
23. Bindl, A. and W.H. Mormann, Clinical evaluation of adhesively placed Cerec endo-crowns after 2 years--preliminary results. *J Adhes Dent*, 1999. 1(3): p. 255-65.
24. Heck, K., et al., Fatigue resistance of ultrathin CAD/CAM ceramic and nanoceramic composite occlusal veneers. *Dent Mater*, 2019. 35(10): p. 1370-1377.
25. Signore, A., et al., A 4- to 6-year retrospective clinical study of cracked teeth restored with bonded indirect resin composite onlays. *Int J Prosthodont*, 2007. 20(6): p. 609-16.
26. Alassaad, S.S., Early Diagnosis and Treatment of Asymptomatic Vertical Enamel and Dentin Cracks. *Compend Contin Educ Dent*, 2017. 38(10): p. 656-661; quiz 662.
27. Ahmed, M.A.A., et al., Fracture resistance of maxillary premolars restored with different endocrown designs and materials after artificial ageing. *J Prosthodont Res*, 2022. 66(1): p. 141-150.

28. Skupien, J.A., M.S. Luz, and T. Pereira-Cenci, Ferrule Effect: A Meta-analysis. *JDR Clin Trans Res*, 2016. 1(1): p. 31-39.
29. Einhorn, M., et al., Preparation Ferrule Design Effect on Endocrown Failure Resistance. *J Prosthodont*, 2019. 28(1): p. e237-e242.
30. Tribst, J.P.M., et al., Full-Crown Versus Endocrown Approach: A 3D-Analysis of Both Restorations and the Effect of Ferrule and Restoration Material. *J Prosthodont*, 2021. 30(4): p. 335-344.
31. Lenz, U., A. Bacchi, and A. Della Bona, Biomechanical performance of endocrown and core-crown restorations: A systematic review. *J Esthet Restor Dent*, 2023.
32. Fages, M., et al., Chairside Computer-Aided Design/Computer-Aided Manufacture All-Ceramic Crown and Endocrown Restorations: A 7-Year Survival Rate Study. *Int J Prosthodont*, 2017. 30(6): p. 556-560.
33. Alnajeeli, O. and G. Gambarini, Are the Endocrowns Better than the Conventional crowns as a Restoration of Posterior Endodontically Treated Teeth? A Systematic Review. *Smile Dental Journal*, 2019. 14(4).
34. Govare, N. and M. Contreipois, Endocrowns: A systematic review. *J Prosthet Dent*, 2020. 123(3): p. 411-418 e9.
35. Thomas, R.M., et al., Comparing endocrown restorations on permanent molars and premolars: a systematic review and meta-analysis. *Br Dent J*, 2020.
36. Bankoglu Gungor, M., et al., Fracture strength of CAD/CAM fabricated lithium disilicate and resin nano ceramic restorations used for endodontically treated teeth. *Dent Mater J*, 2017. 36(2): p. 135-141.
37. Belleflamme, M.M., et al., No post-no core approach to restore severely damaged posterior teeth: An up to 10-year retrospective study of documented endocrown cases. *J Dent*, 2017. 63: p. 1-7.
38. Ferrari Cagidiaco, E., et al., A randomized controlled clinical trial of two types of lithium disilicate partial crowns. *Am J Dent*, 2020. 33(6): p. 291-295.
39. Offer, K., P. Kohorst, and S. Linsen, A Total of 1,132 All-Ceramic Single-Tooth Restorations Show Acceptable Survival Rates up to 15 Years in a Non-University Setting. *Int J Prosthodont*, 2022. 35(6): p. 815-823.
40. Lindner, S., et al., Retrospective clinical study on the performance and aesthetic outcome of pressed lithium disilicate restorations in posterior teeth up to 8.3 years. *Clin Oral Investig*, 2023. 27(12): p. 7383-7393.
41. Sulaiman, T.A., A.J. Delgado, and T.E. Donovan, Survival rate of lithium disilicate restorations at 4 years: A retrospective study. *J Prosthet Dent*, 2015. 114(3): p. 364-6.
42. Frankenberger, R., et al., Evaluation of resin composite materials. Part I: in vitro investigations. *Am J Dent*, 2005. 18(1): p. 23-7.
43. Frankenberger, R. and F.R. Tay, Self-etch vs etch-and-rinse adhesives: effect of thermo-mechanical fatigue loading on marginal quality of bonded resin composite restorations. *Dent Mater*, 2005. 21(5): p. 397-412.
44. Peumans, M., et al., Clinical effectiveness of contemporary adhesives: a systematic review of current clinical trials. *Dent Mater*, 2005. 21(9): p. 864-81.
45. Loguercio, A.D., et al., A new universal simplified adhesive: 36-Month randomized double-blind clinical trial. *J Dent*, 2015. 43(9): p. 1083-1092.
46. Puppin-Rontani, J., et al., Effect of Hydrofluoric Acid Concentration and Etching Time on Bond Strength to Lithium Disilicate Glass Ceramic. *Oper Dent*, 2017. 42(6): p. 606-615.
47. Lopes, G.C., et al., Does a Self-etching Ceramic Primer Improve Bonding to Lithium Disilicate Ceramics? Bond Strengths and FESEM Analyses. *Oper Dent*, 2019. 44(2): p. 210-218.

48. Mazao, J.D., et al., Effect of Ceramic Thickness on Light Attenuation, Degree of Conversion, Knoop Hardness, and Elastic Modulus of Four Luting Resins. *Oper Dent*, 2023. 48(2): p. 226-235.
  49. Flury, S., et al., Light curing through glass ceramics with a second- and a third-generation LED curing unit: effect of curing mode on the degree of conversion of dual-curing resin cements. *Clin Oral Investig*, 2013. 17(9): p. 2127-37.
  50. Flury, S., et al., Light curing through glass ceramics: effect of curing mode on micromechanical properties of dual-curing resin cements. *Clin Oral Investig*, 2014. 18(3): p. 809-18.
  51. Yang, B., et al., Micro-tensile bond strength of three luting resins to human regional dentin. *Dent Mater*, 2006. 22(1): p. 45-56.
  52. Miotti, L., et al., Is conventional resin cement adhesive performance to dentin better than self-adhesive? A systematic review and meta-analysis of laboratory studies. *Operative dentistry*, 2020. 45(5): p. 484-495.
- 

**ZMK 2024; 40 (5) S. 258-266**

**Dr. Tim F. Wolff, M. Sc., Prof. Dr. Dr. Knut A. Grötz**  
**Risikopatienten/-innen in der Zahnmedizin**

1. UnitedNations. World Population Prospects: The 2017 Revision. 2017; Available from: <https://www.un.org/development/desa/publications/world-population-prospects-the-2017-revision.html>.
2. Moßhammer, D., et al., Polypharmazie – Tendenz steigend, Folgen schwer kalkulierbar, Polypharmacy—an upward trend with unpredictable effects. *Dtsch Arztebl Int* 2016. 113(38): p. 627-33.
3. Laroche, M.L., et al., Inappropriate medications in the elderly. *Clin Pharmacol Ther*, 2009. 85(1): p. 94-7.
4. Kuramatsu, J.B., et al., Anticoagulant reversal, blood pressure levels, and anticoagulant resumption in patients with anticoagulation-related intracerebral hemorrhage. *JAMA*, 2015. 313(8): p. 824-36.
5. Kämmerer, P.W. and B. Al-Nawas, Zahnärztliche Chirurgie unter oraler Antikoagulation/Thrombozytenaggregationshemmung - S3-Leitlinie (Langversion) AWMF-Registernummer: 083-018 DGZMK DGMKG 2017.
6. Kunkel, M., (Nach)Bluten oder Sterben? – Das Ende eines Mythos in der Antikoagulation. MKG-Chirurg, 2016. 9: p. 286–288.
7. Wolff, T.F. and K.A. Groetz. Der Umgang mit antikoagulierten Patienten. ZMK 2019; Available from: [https://www.zmk-aktuell.de/fachgebiete/allgemeine-zahnheilkunde/story/der-umgang-mit-antikoagulierten-patienten\\_\\_7910.html](https://www.zmk-aktuell.de/fachgebiete/allgemeine-zahnheilkunde/story/der-umgang-mit-antikoagulierten-patienten__7910.html).
8. Schiegnitz, E. and K.A. Groetz, AGSMO-Laufzettel empfohlen durch die S3-Leitlinie AR-ONJ (007-091; [www.awmf.de](http://www.awmf.de)), [www.agsmo.de](http://www.agsmo.de) oder [www.onkosupport.de](http://www.onkosupport.de). AGSMO.
9. Schiegnitz, E., et al., S3-Leitlinie: Antiresorptiva-assoziierte Kiefernekrosen (AR-ONJ). AWMF 007-091, 2018.
10. Chappuis, V., et al., Medication-related dental implant failure: Systematic review and meta-analysis. *Clin Oral Implants Res*, 2018. 29 Suppl 16: p. 55-68.

11. Luo, J.D., et al., The effect of non-steroidal anti-inflammatory drugs on the osteogenic activity in osseointegration: a systematic review. *Int J Implant Dent*, 2018. 4(1): p. 30.
12. Koch, R. Epidemiologisches Bulletin, aktuelle daten und informationen zu infektionskrankheiten und public health. 2 2015; Available from: [https://www.rki.de/DE/Content/Infekt/EpidBull/Archiv/2015/Ausgaben/05\\_15.pdf;jsessionid=26F7BFA92A8B5DE3419FAF7F266086EB.2\\_cid363?\\_\\_blob=publicationFile](https://www.rki.de/DE/Content/Infekt/EpidBull/Archiv/2015/Ausgaben/05_15.pdf;jsessionid=26F7BFA92A8B5DE3419FAF7F266086EB.2_cid363?__blob=publicationFile).
13. Perez-Castrillon, J.L., et al., Effect of the antihypertensive treatment on the bone mineral density and osteoporotic fracture. *Curr Hypertens Rev* 2005(1): p. 61–66.
14. Pierroz, D.D., et al., Deletion of beta-adrenergic receptor 1, 2, or both leads to different bone phenotypes and response to mechanical stimulation. *J Bone Miner Res*, 2012. 27(6): p. 1252-62.
15. Schlienger, R.G., et al., Use of beta-blockers and risk of fractures. *JAMA*, 2004. 292(11): p. 1326-32.
16. Wu, X., et al., Antihypertensive Medications and the Survival Rate of Osseointegrated Dental Implants: A Cohort Study. *Clin Implant Dent Relat Res*, 2016. 18(6): p. 1171-1182.
17. Mishra, S.K., N.K. Sonnahalli, and R. Chowdhary, Do antihypertensive medications have an effect on dental implants? A systematic review. *Oral Maxillofac Surg*, 2023.
18. De Bruyne, P., et al., Changes in prescription patterns of acid-suppressant medications by Belgian pediatricians: analysis of the national database, [1997-2009]. *J Pediatr Gastroenterol Nutr*, 2014. 58(2): p. 220-5.
19. Mazer-Amirshahi, M., et al., Rising rates of proton pump inhibitor prescribing in US emergency departments. *Am J Emerg Med*, 2014. 32(6): p. 618-22.
20. Targownik, L.E., et al., Use of proton pump inhibitors and risk of osteoporosis-related fractures. *CMAJ*, 2008. 179(4): p. 319-26.
21. O'Connell, M.B., et al., Effects of proton pump inhibitors on calcium carbonate absorption in women: a randomized crossover trial. *Am J Med*, 2005. 118(7): p. 778-81.
22. Wu, X., et al., Proton Pump Inhibitors and the Risk of Osseointegrated Dental Implant Failure: A Cohort Study. *Clin Implant Dent Relat Res*, 2017. 19(2): p. 222-232.
23. Chrcanovic, B.R., et al., Intake of Proton Pump Inhibitors Is Associated with an Increased Risk of Dental Implant Failure. *Int J Oral Maxillofac Implants*, 2017. 32(5): p. 1097-1102.
24. Haney, E.M., et al., Association of low bone mineral density with selective serotonin reuptake inhibitor use by older men. *Arch Intern Med*, 2007. 167(12): p. 1246-51.
25. Carr, A.B., et al., Relationship between Selective Serotonin Reuptake Inhibitors and Risk of Dental Implant Failure. *J Prosthodont*, 2019.
26. Chrcanovic, B.R., et al., Is the intake of selective serotonin reuptake inhibitors associated with an increased risk of dental implant failure? *Int J Oral Maxillofac Surg*, 2017.
27. Bera, R.N., et al., Implant survival in patients with neuropsychiatric, neurocognitive, and neurodegenerative disorders: A meta-analysis. *Natl J Maxillofac Surg*, 2021. 12(2): p. 162-170.
28. Chandra, P., et al., Role of Selective Serotonin Reuptake Inhibitors in Prognosis Dental Implants: A Retrospective Study. *J Pharm Bioallied Sci*, 2021. 13(Suppl 1): p. S92-S96.

- [1] Friction J, Look JO, Wright E, Alencar FGP, Chen H, Lang M et al. Systematic review and meta-analysis of randomized controlled trials evaluating intraoral orthopedic appliances for temporomandibular disorders. *J Orofac Pain* 2010;24:237–54.
- [2] Riley P, Glenny A-M, Worthington HV, Jacobsen E, Robertson C, Durham J et al. Oral splints for patients with temporomandibular disorders or bruxism: a systematic review and economic evaluation. *Health Technol Assess* 2020;24:1–224. <https://doi.org/10.3310/hta24070>.
- [3] Behr M, Stebner K, Kolbeck C, Faltermeier A, Driemel O, Handel G. Outcomes of temporomandibular joint disorder therapy: observations over 13 years. *Acta Odontol Scand* 2007;65:249–53. <https://doi.org/10.1080/00016350701408206>.
- [4] Jokubauskas L, Baltrušaitė A, Pileičikienė G. Oral appliances for managing sleep bruxism in adults: a systematic review from 2007 to 2017. *J Oral Rehabil* 2018;45:81–95. <https://doi.org/10.1111/joor.12558>.
- [5] Macedo CR, Silva AB, Machado MA, Saconato H, Prado GF. Occlusal splints for treating sleep bruxism (tooth grinding). *Cochrane Database Syst Rev* 2007;2007:CD005514. <https://doi.org/10.1002/14651858.CD005514.pub2>.
- [6] Jagger R. The effectiveness of occlusal splints for sleep bruxism. *Evid Based Dent* 2008;9:23. <https://doi.org/10.1038/sj.ebd.6400569>.
- [7] Rosentritt M, Schmidt M, Wulff J, Rauch A. Material für digitale Schienen. *Quintessenz Zahntechnik* 2023;2023:482–90.
- [8] Benli M, Eker Gümüş B, Kahraman Y, Gökçen-Rohlig B, Evlioğlu G, Huck O et al. Surface roughness and wear behavior of occlusal splint materials made of contemporary and high-performance polymers. *Odontology* 2020;108:240–50. <https://doi.org/10.1007/s10266-019-00463-1>.
- [9] Rosentritt M, Huber C, Strasser T, Schmid A. Investigating the mechanical and optical properties of novel Urethandimethacrylate (UDMA) and Urethanmethacrylate (UMA) based rapid prototyping materials. *Dent Mater* 2021;37:1584–91. <https://doi.org/10.1016/j.dental.2021.08.009>.
- [10] Wedekind L, Güth J-F, Schweiger J, Kollmuss M, Reichl F-X, Edelhoff D et al. Elution behavior of a 3D-printed, milled and conventional resin-based occlusal splint material. *Dent Mater* 2021;37:701–10. <https://doi.org/10.1016/j.dental.2021.01.024>.
- [11] Kim D, Shim J-S, Lee D, Shin S-H, Nam N-E, Park K-H et al. Effects of Post-Curing Time on the Mechanical and Color Properties of Three-Dimensional Printed Crown and Bridge Materials. *Polymers (Basel)* 2020;12. <https://doi.org/10.3390/polym12112762>.
- [12] Reymus M, Stawarczyk B. Influence of Different Postpolymerization Strategies and Artificial Aging on Hardness of 3D-Printed Resin Materials: An In Vitro Study. *Int J Prosthodont* 2020;33:634–40. <https://doi.org/10.11607/ijp.6634>.
- [13] Prpić V, Schauperl Z, Ćatić A, Dulčić N, Čimić S. Comparison of Mechanical Properties of 3D-Printed, CAD/CAM, and Conventional Denture Base Materials. *J Prosthodont* 2020;29:524–8. <https://doi.org/10.1111/jopr.13175>.
- [14] Wulff J, Schmid A, Huber C, Rosentritt M. Dynamic fatigue of 3D-printed splint materials. *J Mech Behav Biomed Mater* 2021;124:104885. <https://doi.org/10.1016/j.jmbbm.2021.104885>.
- [15] Berli C, Thieringer FM, Sharma N, Müller JA, Dedem P, Fischer J et al. Comparing the mechanical properties of pressed, milled, and 3D-printed resins for occlusal devices. *J Prosthet Dent* 2020. <https://doi.org/10.1016/j.jprosdent.2019.10.024>.
- [16] Gibreel M, Perea-Lowery L, Vallittu PK, Lassila L. Characterization of occlusal splint materials: CAD-CAM versus conventional resins. *J Mech Behav Biomed Mater* 2021;124:104813. <https://doi.org/10.1016/j.jmbbm.2021.104813>.

- [17] Rosentritt M, Behr M, Strasser T, Schmid A. Pilot in-vitro study on insertion/removal performance of hand-cast, milled and 3D printed splints. *J Mech Behav Biomed Mater* 2021;121:104612. <https://doi.org/10.1016/j.jmbbm.2021.104612>.
- [18] Alharbi N, Osman R, Wismeijer D. Effects of build direction on the mechanical properties of 3D-printed complete coverage interim dental restorations. *J Prosthet Dent* 2016;115:760–7. <https://doi.org/10.1016/j.prosdent.2015.12.002>.
- [19] Väyrynen VOE, Tanner J, Vallittu PK. The anisotropicity of the flexural properties of an occlusal device material processed by stereolithography. *J Prosthet Dent* 2016;116:811–7. <https://doi.org/10.1016/j.prosdent.2016.03.018>.
- [20] Perea-Lowery L, Gibreel M, Vallittu PK, Lassila L. Evaluation of the mechanical properties and degree of conversion of 3D printed splint material. *J Mech Behav Biomed Mater* 2021;115:104254. <https://doi.org/10.1016/j.jmbbm.2020.104254>.
- [21] Reymus M, Stawarczyk B. In vitro study on the influence of postpolymerization and aging on the Martens parameters of 3D-printed occlusal devices. *J Prosthet Dent* 2021;125:817–23. <https://doi.org/10.1016/j.prosdent.2019.12.026>.
- [22] Wada J, Wada K, Gibreel M, Wakabayashi N, Iwamoto T, Vallittu PK et al. Effect of 3D Printer Type and Use of Protection Gas during Post-Curing on Some Physical Properties of Soft Occlusal Splint Material. *Polymers (Basel)* 2022;14. <https://doi.org/10.3390/polym14214618>.
- [23] Grymak A, Aarts JM, Ma S, Waddell JN, Choi JJE. Comparison of hardness and polishability of various occlusal splint materials. *J Mech Behav Biomed Mater* 2021;115:104270. <https://doi.org/10.1016/j.jmbbm.2020.104270>.
- [24] Grymak A, Aarts JM, Ma S, Waddell JN, Choi JJE. Wear Behavior of Occlusal Splint Materials Manufactured By Various Methods: A Systematic Review. *J Prosthodont* 2021. <https://doi.org/10.1111/jopr.13432>.
- [25] Hickl V, Strasser T, Schmid A, Rosentritt M. Effects of storage and toothbrush simulation on color, gloss, and roughness of CAD/CAM, hand-cast, thermoforming, and 3D-printed splint materials. *Clin Oral Invest* 2022. <https://doi.org/10.1007/s00784-022-04391-3>.
- [26] Orgev A, Levon JA, Chu T-MG, Morton D, Lin W-S. The effects of manufacturing technologies on the surface accuracy of CAD-CAM occlusal splints. *J Prosthodont* 2022. <https://doi.org/10.1111/jopr.13610>.
- [27] Marcel R, Reinhard H, Andreas K. Accuracy of CAD/CAM-fabricated bite splints: milling vs 3D printing. *Clin Oral Invest* 2020;24:4607–15. <https://doi.org/10.1007/s00784-020-03329-x>.
- [28] Palazzo G, Ronsivalle V, Oteri G, Lo Giudice A, Toro C, Campagna P et al. Comparison between Additive and Subtractive CAD-CAM Technique to Produce Orthognathic Surgical Splints: A Personalized Approach. *J Pers Med* 2020;10. <https://doi.org/10.3390/jpm10040273>.

---

**ZMK 2024; 40 (5) S. 282-287**

**Prof. Dr. Etyenne Schnurr, Dr. Gregor Hocevar, Dr Ulrich Volz**

**Ästhetik und Funktionalität von Implantaten aus Zirkoniumdioxid im Seitenzahnbereich auf Gewebeniveau**

- [1] Sales PHDH, Barros AWP, Oliveira-Neto OB, de Lima FJC, Carvalho AAT, Leão JC. Do zirconia dental implants present better clinical results than titanium dental implants? A systematic review and

- meta-analysis. *J Stomatol Oral Maxillofac Surg.* 2023 Feb;124(1S):101324. doi: 10.1016/j.jormas.2022.10.023. Epub 2022 Oct 29. PMID: 36330865.
- [2] Schoenbaum TR, Karateew ED, Schmidt A, Jadsadakraisorn C, Neugebauer J, Stanford CM. Implant-Abutment Connections and Their Effect on Implant Survival Rates and Changes in Marginal Bone Levels ( $\Delta$ ): A Systematic Review and Meta-Analysis of 45,347 Oral Implants. *Int J Oral Maxillofac Implants.* 2023 May-Jun;38(suppl):37-45. doi: 10.11607/jomi.10411. PMID: 37436948.
- [3] Taheri Otaghsara SS, Joda T, Thieringer FM. Accuracy of dental implant placement using static versus dynamic computer-assisted implant surgery: An in vitro study. *J Dent.* 2023 May;132:104487. doi: 10.1016/j.jdent.2023.104487. Epub 2023 Mar 21. PMID: 36948382.
- [4] Schnurr E, Hocevar G, Volz U. Weichgewebemanagement bei sofortbelasteten Zirkonoxidimplantaten: was ist wichtig? *Dentale Implantologie.* 2023;27:156–161.
- [5] Ghanaati S, Choukroun J, Volz KU, Hueber R, Mourão CFAB, Sader R, Kawase-Koga Y, Mazhari R, Amrein K, Meybohm P, Al-Maawi S. One hundred years after Vitamin D discovery: is there clinical evidence for supplementation doses? *Int J Growth Factors Stem Cells Dent.* 2020;3(1):3–11.
- [6] Swiss Biohealth Academy. The Swiss Biohealth Concept®. Available at: [https://www.swiss-biohealth.com/wp-content/uploads/2021\\_Swiss-Biohealth-Concept-de-web.pdf](https://www.swiss-biohealth.com/wp-content/uploads/2021_Swiss-Biohealth-Concept-de-web.pdf). Accessed July 27, 2023.
- [7] Schnurr E, Volz KU. Die Beziehung zwischen oralen Infektionen, Biokorrosion und systemischer Gesundheit: ein Behandlungskonzept. Available at: <https://sportaerztezeitung.com/rubriken/therapie/13828/oralen-infektionen-biokorrosion-und-systemischer-gesundheit/>. Accessed April 17, 2023.
- [8] Ghanaati S, Booms P, Orlowska A, Kubesch A, Lorenz J, Rutkowski J, Landes C, Sader R, Kirkpatrick C, Choukroun J. Advanced platelet-rich fibrin: a new concept for cell-based tissue engineering by means of inflammatory cells. *J Oral Implantol.* 2014;40(6):679–689. doi: 10.1563/aaid-joi-D-14-00138
- [9] Misch CE, Perel ML, Wang HL, et al. Implant success, survival, and failure: the International Congress of Oral Implantologists (ICOI) Pisa Consensus Conference. *Implant Dent.* 2008;17(1):5–15. doi: 10.1097/ID.0b013e3181676059
- [10] Atieh MA, Payne AG, Duncan WJ, de Silva RK, Cullinan MP. Immediate placement or immediate restoration/loading of single implants for molar tooth replacement: a systematic review and metaanalysis. *Int J Oral Maxillofac Implants* 2010;25:401-15.
- [11] Smith RB, Tarnow DP. Classification of molar extraction sites for immediate dental implant placement: technical note. *Int J Oral Maxillofac Implants* 2013;28:911-6. <https://doi.org/10.11607/jomi.2627>
- [12] Ananda GK, Nambiar P, Mutualik S, Shanmuhasuntharam P. Anatomical considerations for implant placements in first maxillary molar extracted sites in East Asian patients. *Surg Radiol Anat* 2015;37:1099-108. <https://doi.org/10.1007/s00276-015-1473-0>
- [13] Ketabi M, Deporter D, Atenafu EG. A systematic review of outcomes following immediate molar implant placement based on recently published studies. *Clin Implant Dent Relat Res* 2016;18:1084-94. <https://doi.org/10.1111/cid.12390>
- [14] Fugazzotto PA. Implant placement at the time of maxillary molar extraction: treatment protocols and report of results. *J Periodontol* 2008;79:216-23. <https://doi.org/10.1902/jop.2008.070338>
- [15] Ragucci GM, Elnayef B, Criado-Cámarra E, Del Amo FS, Hernández-Alfaro F. Immediate implant placement in molar extraction sockets: a systematic review and meta-analysis. *Int J Implant Dent* 2020;6:40. <https://doi.org/10.1186/s40729-020-00235-5>

- [16] Müller-Heupt LK, Schiegnitz E, Kaya S, Jacobi-Gresser E, Kämmerer PW, Al-Nawas B. The German S3 guideline on titanium hypersensitivity in implant dentistry: consensus statements and recommendations. *Int J Implant Dent.* 2022;8(1):51. doi: 10.1186/s40729-022-00451-1
- [17] Thiem DGE, Stephan D, Kniha K, Kohal RJ, Röhling S, Spies BC, Stimmelmayr M, Grötz KA. German S3 guideline on the use of dental ceramic implants. *Int J Implant Dent.* 2022;8(1):43. doi: 10.1186/s40729-022-00445-z. Erratum in: *Int J Implant Dent.* 2023;9(1):2. doi: 10.1186/s40729-022-00465-9
- [18] Osman RB, Swain MV, Atieh M, Ma S, Duncan W. Ceramic implants (Y-TZP): are they a viable alternative to titanium implants for the support of overdentures? A randomized clinical trial. *Clin Oral Implants Res* 2014;25:1366–77.
- [19] Koller M, Steyer E, Theisen K, Stangnell S, Jakse N, Payer M. Two piece zirconia versus titanium implants after 80 months: Clinical outcomes from a prospective randomized pilot trial. *Clin Oral Implants Res* 2020;31:388–96.
- [20] Henao PAR, Queija LC, Mareque S, Pereira AT, González AL, Carrion JB. Titanium vs ceramic single dental implants in the anterior maxilla: a 12-month randomized clinical trial. *Clin Oral Implants Res* 2021;32:951–61.
- [21] Cannizzaro G, Torchio C, Felice P, Leone M, Esposito M. Immediate occlusal versus non-occlusal loading of single zirconia implants. A multicenter pragmatic randomized clinical trial. *Eur J Oral Implantol* 2010;3:111–20.
- [22] Cionca N, Hashim D, Mombelli A. Two-piece zirconia implants supporting all ceramic crowns: six-year results of a prospective cohort study. *Clin Oral Implants Res* 2021;31:695–701.
- [23] Roehling S, Schlegel KA, Woelfler H, Gahlert M. Zirconia compared to titanium dental implants in preclinical studies-A systematic review and meta-analysis. *Clin Oral Implants Res.* 2019 May;30(5):365-395. doi: 10.1111/clr.13425. Epub 2019 Apr 16. PMID: 30916812.
- [24] Mustakim KR, Eo MY, Lee JY, Myoung H, Seo MH, Kim SM. Guidance, and rationale for the immediate implant placement in the maxillary molar. *J Korean Assoc Oral Maxillofac Surg.* 2023 Feb 28;49(1):30-42. doi: 10.5125/jkaoms.2023.49.1.30. PMID: 36859373; PMCID: PMC9985995.
- [25] Jensen OT, Shulman LB, Block MS, Iacono VJ. Report of the sinus consensus conference of 1996. *Int J Oral Maxillofac Implants* 1998;13 Suppl:11-45.
- [26] Parvini P, Mihatovic I, Sahin D, Becker J, Schwarz F. Lateral alveolar ridge augmentation using an equine-derived collagen-containing bone block: A prospective case series. *Clin Oral Implants Res.* 2022 Feb;33(2):142-149. doi: 10.1111/clr.13873. Epub 2021 Oct 30. PMID: 34679206.
- [27] Buser, D., Dula, K., Hirt, H. P., & Schenk, R. K. (1996). Lateral ridge augmentation using autografts and barrier membranes: A clinical study with 40 partially edentulous patients. *Journal of Oral and Maxillofacial Surgery*, 54, 420–432. [https://doi.org/10.1016/S0278-2391\(96\)90113-5](https://doi.org/10.1016/S0278-2391(96)90113-5)
- [28] Schwarz, F., Hazar, D., Becker, K., Sader, R., & Becker, J. (2018). Efficacy of autogenous tooth roots for lateral alveolar ridge augmentation and staged implant placement. A prospective controlled clinical study. *Journal of Clinical Periodontology*, 45, 996–1004. <https://doi.org/10.1111/jcpe.12977>