BÖLÜM 8

İMPLANT DESTEKLİ KRONLARDA MALZEME SEÇİMİ VE OKLÜZYON

Abdulhaluk SAVAŞ[1]

GİRİŞ

Tam seramik restorasyonların yaygınlaşması ve bilgisayar destekli tasarım–bilgisayar destekli üretim (CAD-CAM) iş akışlarının olgunlaşması implant-destekli tek kronlarda tam seramiklerin kullanımını arttırmıştır. Özellikle lityum disilikat ve monolitik zirkonya gibi materyallerin klinik kullanımını belirgin biçimde artırmıştır. Bu eğilim yalnızca estetik taleplerle değil, monolitik tasarımların veneer porseleni kırığı (chipping) riskini azaltması ve tek randevuda restorasyonların üretilip hastaya teslim edilme olanağıyla da ilişkilidir (1).

Bununla birlikte malzeme seçimi, sadece estetik ve dayanım ikileminden ibaret değildir. Karar; implantın periodantal ligamentsiz biyomekaniği, hastaya özgü oklüzal yük profili ve parafonksiyon varlığı, retansiyon tipi (vida/siman), Ti-base ile oluşturulan arayüzün davranışı ve restorasyonun oklüzal düzeni gibi birbirine bağlı değişkenlerin birlikte değerlendirilmesini gerektirir. İmplantlarda periodontal ligamentin yokluğu, yüklerin kemiğe daha doğrudan iletilmesine neden olduğundan, temasların kontrollü tasarlandığı implant-koruyucu oklüzyon ilkeleri klinik planlamanın temelini oluşturur (2, 3). Retansiyon tercihi de biyolojik ve teknik komplikasyon profilini etkiler; vida-tutuculu çözümler artık siman riskini azaltırken, siman-tutuculu tasarımlar bazı olgularda estetik ve erişim avantajları sağlayabilir (4).

BİYOMEKANİK TEMELLER: DİŞ–İMPLANT FARKI

Temel olarak doğal dişler ve implantlar arasındaki biyomekanik farklılıkları tanımak ve bunlara uyum sağlamak, etkili oklüzal tasarım için kritik öneme sahiptir. Bu durum implantların uzun vadeli başarısını ve stabilitesini sağlar. Doğal dişler

[1] Dr., Sağlık Bakanlığı Beyhekim Ağız ve Diş Sağlığı Hastanesi, haluk_savas@hotmail.com, ORCID iD: 0000-0002-8897-3928

DOI: 10.37609/akya.3815.c726

baz yüzeyi kumlanır/aktiflenir, lityum disilikat iç yüzeyi hidroflorik asit ve silan ile hazırlanır ve dual-cure rezin simanla adeziv bağ kurulur. Derin subgingival marjin veya çıkarılabilirlik gereksiniminde vida-tutuculu ya da hibrit abutment kron tasarım biyolojik riski (artık siman) azaltır. Teslimde hafif santral temas elde edilir; eksentirik temaslar kaldırılır. Her türlü oklüzal düzeltme sonrası seramiğe yüksek parlak polisaj uygulanır. Antagonist aşınması endişesinde polisajlı zirkonya veya lityum disilikat tercih edilebilir; her iki durumda da yüzey bitimi kilit değişkendir (1, 4, 37). Kontrol randevularında vida torku, oklüzal temaslar ve simanlı tasarımlarda artık siman varlığı düzenli izlenir (4, 40, 41).

SONUÇ

İmplant destekli tek kronlarda malzeme seçimi, biyomekanik gerçeklik (periodontal ligaman yokluğu), oklüzal risk profili, estetik gereksinim ve retansiyon stratejisi ekseninde yapılmalıdır. Kanıtlar, monolitik zirkonyanın posterior yüksek yükte; lityum disilikatın ise anterior bölgede estetik üstünlüğüyle güçlü bir seçenek olduğunu desteklemektedir. İmplant koruyucu oklüzyon ilkeleri, uygun Ti-base abutment–seramik bağlantısı ve yüzey bitiminin titizlikle yönetilmesi, hem teknik hem biyolojik komplikasyonları anlamlı ölçüde azaltır (1, 2, 37).

KAYNAKLAR

1. Pjetursson BE, Valente NA, Strasding M, Zwahlen M, Liu S, Sailer I. A systematic review of the survival and complication rates of zirconia-ceramic and metal-ceramic single crowns. Clin Oral Implants Res. 2018;29:199-214.
2. Kim Y, Oh TJ, Misch CE, Wang HL. Occlusal considerations in implant therapy: clinical guidelines with biomechanical rationale. Clin Oral Implants Res. 2005;16(1):26-35.
3. Yuan JC-C, Sukotjo C. Occlusion for implant-supported fixed dental prostheses in partially edentulous patients: a literature review and current concepts. J Periodontal Implant Sci. 2013;43(2):51.
4. Wittneben J-G, Millen C, Brägger U. Clinical Performance of Screw-Versus Cement-Retained Fixed Implant-Supported Reconstructions-A Systematic Review. Int J Oral Maxillofac Implants. 2014;29.
5. Ishigaki S, Nakano T, Yamada S, Nakamura T, Takashima F. Biomechanical stress in bone surrounding an implant under simulated chewing. Clin Oral Implants Res. 2003;14(1):97-102.
6. Lin P-J, Su K-C. Biomechanical design application on the effect of different occlusion conditions on dental implants with different positions—A finite element analysis. Applied Sciences. 2020;10(17):5826.
7. Peck C. Biomechanics of occlusion–implications for oral rehabilitation. J Oral Rehabil. 2016;43(3):205-14.
8. Stoichkov B, Kirov D. Analysis of the causes of dental implant fracture: A retrospective clinical study. Quint Int. 2018;49(4).
9. Rekow D, Thompson V. Near-surface damage-a persistent problem in crowns obtained by computer-aided design and manufacturing. Proc Inst Mech Eng H: J Eng Med. 2005;219(4):233-43.
10. Di Francesco P, Bechir A, Popescu AI, Chivu MV, Dobrescu AM, Comăneanu RM, et al. Finite element analysis (FEA) of the stress behavior of some dental materials. J Med Life.

2025;18(1):29.
11. Sengupta P, Bhattacharjee A, Maiti HS. Zirconia: a unique multifunctional ceramic material. T Indian I Metals. 2019;72(8):1981-98.
12. Parmigiani-Izquierdo JM, Cabaña-Muñoz ME, Merino JJ, Sánchez-Pérez A. Zirconia implants and peek restorations for the replacement of upper molars. Int J Implant Dent. 2017;3(1):5.
13. Malkondu Ö, Tinastepe N, Akan E, Kazazoğlu E. An overview of monolithic zirconia in dentistry. Biotechnol Biotechnol Equip. 2016;30(4):644-52.
14. Rammelsberg P, Bermejo JL, Kappel S, Meyer A, Zenthöfer A. Long-term performance of implant-supported metal-ceramic and all-ceramic single crowns. J Prosthodont Res. 2020;64(3):332-9.
15. Tang Z, Zhao X, Wang H, Liu B. Clinical evaluation of monolithic zirconia crowns for posterior teeth restorations. Medicine. 2019;98(40):e17385.
16. Deste Gökay G, Oyar P, Gökçimen G, Durkan R. Static and dynamic stress analysis of different crown materials on a titanium base abutment in an implant-supported single crown: a 3D finite element analysis. BMC Oral Health. 2024;24(1):545.
17. Vilhjálmsson VH, Klock KS, Størksen K, Bårdsen A. Aesthetics of implant-supported single anterior maxillary crowns evaluated by objective indices and participants' perceptions. Clin Oral Implants Res. 2011;22(12):1399-403.
18. Obermeier M, Ristow O, Erdelt K, Beuer F. Mechanical performance of cement–and screw–retained all–ceramic single crowns on dental implants. Clin Oral Investig. 2018;22(2):981-91.
19. Rosentritt M, Hahnel S, Engelhardt F, Behr M, Preis V. In vitro performance and fracture resistance of CAD/CAM-fabricated implant supported molar crowns. Clin Oral Investig. 2017;21(4):1213-9.
20. Spies BC, Patzelt SBM, Vach K, Kohal RJ. Monolithic lithium-disilicate single crowns supported by zirconia oral implants: three-year results of a prospective cohort study. Clin Oral Implants Res. 2016;27(9):1160-8.
21. Pozzi A, Tallarico M, Barlattani A. Monolithic lithium disilicate full-contour crowns bonded on CAD/CAM zirconia complete-arch implant bridges with 3 to 5 years of follow-up. J Oral Implantol. 2015;41(4):450-8.
22. El-Mahdy M, Aboelfadl A, Ahmed F, El-Banna A, Wahsh M. Strain gauge analysis and fracture resistance of implant-supported PEKK hybrid abutments restored with two crown materials: An in vitro study. Dent. Med. Probl. 2023;60(3):497-503.
23. Tekin S, Değer Y, Demirci F. Evaluation of the use of PEEK material in implant-supported fixed restorations by finite element analysis. Niger J Clin Pract. 2019;22(9):1252-8.
24. Ernst C-P, Martin M, Stuff S, Willershausen B. Clinical performance of a packable resin composite for posterior teeth after 3 years. Clin Oral Investig. 2001;5(3):148-55.
25. Ghavami-Lahiji M, Hooshmand T. Analytical methods for the measurement of polymerization kinetics and stresses of dental resin-based composites: A review. Dent Res J (Isfahan). 2017;14(4):225-40.
26. Saleem I, Rana NF, Tanweer T, Arif W, Shafique I, Alotaibi AS, et al. Effectiveness of Se/ZnO NPs in enhancing the antibacterial activity of resin-based dental composites. Materials. 2022;15(21):7827.
27. Wiertelak-Makała K, Szymczak-Pajor I, Bociong K, Śliwińska A. Considerations about cytotoxicity of resin-based composite dental materials: A systematic review. Int J Mol Sci. 2023;25(1):152.
28. Strasding M, Marchand L, Merino E, Zarauz C, Pitta J. Material and abutment selection for CAD/CAM implant-supported fixed dental prostheses in partially edentulous patients–A narrative review. Clin Oral Implants Res. 2024;35(8):984-99.
29. Larsson A, Manuh J, Chrcanovic BR. Risk factors associated with failure and technical complications of implant-supported single crowns: A retrospective study. Medicina. 2023;59(9):1603.
30. Schwarz S, Schröder C, Hassel A, Bömicke W, Rammelsberg P. Survival and chipping of zirconia-based and metal–ceramic implant-supported single crowns. Clin Implant Dent Relat Res.

2012;14:e119-e25.
31. Jivraj S, Chee W. Treatment planning of implants in posterior quadrants. Br Dent J. 2006;201(1):13-23.
32. Hosseini M, Worsaae N, Schiødt M, Gotfredsen K. A 3-year prospective study of implant-supported, single-tooth restorations of all-ceramic and metal-ceramic materials in patients with tooth agenesis. Clin Oral Implants Res. 2013;24(10):1078-87.
33. Tunchel S, Blay A, Kolerman R, Mijiritsky E, Shibli JA. 3D printing/additive manufacturing single titanium dental implants: a prospective multicenter study with 3 years of follow-up. I Int J Dent. 2016;2016(1):8590971.
34. Chee W, Jivraj S. Screw versus cemented implant supported restorations. Br Dent J. 2006;201(8):501-7.
35. Fiorillo L, D'Amico C, Ronsivalle V, Cicciù M, Cervino G. Single dental implant restoration: cemented or screw-retained? A systematic review of multi-factor randomized clinical trials. Prosthesis. 2024;6(4):871-86.
36. Wolfart S, Rittich A, Groß K, Hartkamp O, von der Stück A, Raith S, et al. Cemented versus screw-retained posterior implant-supported single crowns: A 24-month randomized controlled clinical trial. Clin Oral Implants Res. 2021;32(12):1484-95.
37. Hamed MT, Abdullah Mously H, Khalid Alamoudi S, Hossam Hashem AB, Hussein Naguib G. A systematic review of screw versus cement-retained fixed implant supported reconstructions. Clin Cosmet Investig Dent. 2020:9-16.
38. Shadid R, Sadaqa N. A comparison between screw-and cement-retained implant prostheses. A literature review. J Oral Implantol. 2012;38(3):298-307.
39. Strauss FJ, Siegenthaler M, Hämmerle CH, Sailer I, Jung RE, Thoma DS. Restorative angle of zirconia restorations cemented on non-original titanium bases influences the initial marginal bone loss: 5-year results of a prospective cohort study. Clin Oral Implants Res. 2022;33(7):745-56.
40. Amornwichitwech L, Palanuwech M. Shear Bond Strength of Lithium Disilicate Bonded with Various Surface-Treated Titanium. Int J Dent. 2022;2022(1):4406703.
41. Tuncer B, Aktas G, Baris Guncu M, Deniz D, Muhtarogullari M, Al-Haj Husain N, et al. Effects of surface treatments and cement type on shear bond strength between titanium alloy and all-ceramic materials. Materials. 2023;16(18):6240.
42. Crespi R, Capparè P, Gastaldi G, Gherlone EF. Immediate occlusal loading of full-arch rehabilitations: screw-retained versus cement-retained prosthesis. An 8-year clinical evaluation. Int J Oral Maxillofac Implants. 2014;29(6).
43. Sherif S, Susarla SM, Hwang J-W, Weber H-P, Wright RF. Clinician-and patient-reported long-term evaluation of screw-and cement-retained implant restorations: a 5-year prospective study. Clin Oral Investig. 2011;15(6):993-9.
44. Lamperti ST, Wolleb K, Hämmerle CH, Jung RE, Hüsler J, Thoma DS. Cemented versus screw-retained zirconia-based single-implant restorations: 5-year results of a randomized controlled clinical trial. Clin Oral Implants Res. 2022;33(4):353-61.
45. Kotsakis GA, Zhang L, Gaillard P, Raedel M, Walter MH, Konstantinidis IK. Investigation of the association between cement retention and prevalent peri-implant diseases: a cross-sectional study. J Periodontol. 2016;87(3):212-20.
46. Weigl P, Saarepera K, Hinrikus K, Wu Y, Trimpou G, Lorenz J. Screw-retained monolithic zirconia vs. cemented porcelain-fused-to-metal implant crowns: a prospective randomized clinical trial in split-mouth design. Clin Oral Investig. 2019;23(3):1067-75.
47. Dib Zakkour J, Dib Zakkour S, Montero J, García-Cenador B, Flores-Fraile J, Dib Zaitun A. Digital analysis of occlusion in fixed partial implant prostheses: how to overcome age-related changes in the stomatognathic system. Prosthesis. 2024;6(1):119-34.
48. Koyano K, Esaki D. Occlusion on oral implants: current clinical guidelines. J Oral Rehabil. 2015;42(2):153-61.
49. Chowdhary R, Sonnahalli NK. Clinical applications of the T-Scan quantitative digital occlusal

analysis technology: a systematic review. Int J Comput Dent. 2023:0-.
50. Stilwell C. Occlusal considerations in maintaining health of implants and their restorations. Br Dent J. 2024;236(10):773-9.
51. Chambrone L, Chambrone LA, Lima LA. Effects of occlusal overload on peri-implant tissue health: a systematic review of animal-model studies. J Periodontol. 2010;81(10):1367-78.
52. Klineberg I, Kingston D, Murray G. The bases for using a particular occlusal design in tooth and implant-borne reconstructions and complete dentures. Clin Oral Implants Res. 2007;18:151-67.
53. Ren S, Jiang X, Di P. Auxiliary occlusal devices for IO scanning in a complete digital workflow of implant-supported crowns: a randomized controlled trial. BMC Oral Health. 2024;24(1):374.
54. Anadioti E, Kane B, Soulas E. Current and emerging applications of 3D printing in restorative dentistry. Current oral Health reports. 2018;5(2):133-9.
55. Neville P, van Der Zande MM. Dentistry, e-health and digitalisation: A critical narrative review of the dental literature on digital technologies with insights from health and technology studies. Community Dent Health. 2020;37(1):51-8.
56. Valente F, Marrocco A, Falcinelli C. Impact of physiological and non-physiological loading scenarios and crown material on periimplant bone stress distribution: A 3D finite element study. journal of the mechanical behavior of biomedical materials. 2025;163:106894.
57. Flanagan D. Bite force and dental implant treatment: A short review. Med Devices (Auckl). 2017:141-8.
58. Lobbezoo F, Brouwers J, Cune M, Naeije M. Dental implants in patients with bruxing habits. J Oral Rehabil. 2006;33(2):152-9.
59. Beddis H, Pemberton M, Davies S. Sleep bruxism: an overview for clinicians. Br Dent J. 2018;225(6):497-501.
60. Chrcanovic BR, Kisch J, Larsson C. Retrospective evaluation of implant-supported full-arch fixed dental prostheses after a mean follow-up of 10 years. Clin Oral Implants Res. 2020;31(7):634-45.