

## Bölüm 4

# BİLGİSAYAR DESTEKLİ-REHBERLİ İMPLANT CERRAHİSİ

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### GİRİŞ

Dental implantların uygun konumda çene kemiği içerisine yerleşimi, sinir hasarı ve kemik perforasyonu gibi oluşabilecek cerrahi komplikasyonları azaltmaktadır. Rehberli implant cerrahisi, implantların çene kemiği içerisine ideal konumda yerleşimlerini sağlamak amacıyla kullanılan bir tedavi yöntemidir. Dijital planlama, kişiye özel cerrahi rehber üretimi ve implant uygulama aşamalarını ifade eder. Rehberli implant cerrahisi farklı basamaklardan oluşan komplike bir tedavi yöntemidir. Bu basamakların her birinde önemli problemler meydana gelebilir ve meydana gelen problemlerden dolayı uygulanan tedavi olumsuz sonuçlanabilir. Rehberli implant cerrahisi, geleneksel implant cerrahisi ile karşılaştırıldığında tedavi daha kısa sürede tamamlanmaktadır. Bunun asıl nedeni tedavi protokolü sırasında flep kaldırma operasyonunun yapılmaması ve sonrasında sütür ihtiyacının bulunmamasıdır. Ayrıca flepsiz tedavi protokolüne bağlı olarak post-operatif ağrı, ödem, kanama ve trismus oluşma riski azalmaktadır.

### TARİHÇE

Radyografi dönemi, 19. yy'ın sonlarında Wilhelm Conrad Roentgen'in X-ışınlarını keşfi ile başlamıştır. Şu anda non-invaziv bir teknik olarak internal anatomik yapıların değerlendirilmesinde kullanılmaktadır. Eskiden tek sınırlama, mineralize yapıların yalnızca iki boyutlu olarak değerlendirilmesiydi (1, 2). Alan McLead Cormack ile 1979 Nobel Ödülü'nü paylaşan bir İngiliz elektrik mühendisi olan Sir Godfrey Newbold Hounsfield, farklı yönlerden veya açılardan 3-boyutlu olarak incelenebilecek radyografiler elde etmek için dijital bir yöntem geliştirmiştir (3, 4). Başlangıçta bilgisayarlı aksiyal tomografi ve daha sonra bilgisayarlı tomografi olarak adlandırılan bu yeni teknik, konvansiyonel tomografiden yaklaşık 100 kat

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1. Statik bilgisayar destekli implant cerrahisi kapsamlı tanı, tedavi planlaması ve cerrahi prosedürler için ek bir araç olarak düşünülmelidir.
2. Bu sistemde implantlar protetik olarak yüklenmelidir.
3. Bu sistemde yerleştirilen implantlar için doğru ve olumlu bir sonuç elde etmek için cerrahi deneyim ve genel kapsamlı bir eğitim gerekmektedir.

## **SONUÇ**

Rehberli implant cerrahisi, dental implant tedavisi gerektiğinde hasta ve hekim için avantajlı bir prosedür olabilir. Bu avantajlara rağmen prosedürün her adımında farklı hatalar meydana gelebilir. Rehberli implant cerrahi sürecinin tam olarak anlaşılması, kapsamlı ve dikkatli cerrahi teknik, kapsamlı eğitim ve yeterli vaka hazırlığının mevcut olması koşuluyla bu riskleri ortadan kaldırmak veya azaltmak mümkündür.

## **KAYNAKÇA**

1. Keevil G. The roentgen rays. J Am Med Assoc. 1833;XXVI(7):336.
2. Marsh H. A case of Roentgen photography. Br Med J. 1848;1318-20.
3. Ambrose J, Hounsfield G. Computerized transverse axial tomography. Br J Radiol. 1973 Feb;46(542):148-9.
4. Hounsfield GN. Computed medical imaging. Med Phys [Internet]. 1980 Jul 1;7(4):283-90. Available from: <https://doi.org/10.1118/1.594709>
5. Brown R. A stereotactic head frame for use with CT body scanners. Invest Radiol. 1979;14:300-4.
6. Walsh P, Larson S, Rytel M, Maiman D. Stereotactic aspiration of deep cerebral abscesses after CT-directed labeling. Appl Neurophysio. 1980;43:205-9.
7. Solomon W. The viewing wand - its introduction and uses. Br J Theatr Nurs. 1996;6:11-4.
8. Sipos E, Tebo S, Zinreich S, Long D, Brem H. In Vivo accuracy testing and clinical experience with the ISG Viewing Wand. Neurosurgery. 1996;39:202-4.
9. Dyer P V, Patel N, Pell GM, Cummins B, Sandeman DR. The ISG viewing wand: an application to atlanto-axial cervical surgery using the Le Fort I maxillary osteotomy. Br J Oral Maxillofac Surg [Internet]. 1995 Dec 1;33(6):370-4. Available from: [https://doi.org/10.1016/0266-4356\(95\)90138-8](https://doi.org/10.1016/0266-4356(95)90138-8)
10. Schlenzka D, Laine T, Lund T. Computer-assisted spine surgery. Eur Spine J. 2000;9(1):57-64.
11. Buser D, Wittneben J, Bornstein MM, Grütter L, Chappuis V, Belser UC. Stability of Contour Augmentation and Esthetic Outcomes of Implant-Supported Single Crowns in the Esthetic Zone: 3-Year Results of a Prospective Study With Early Implant Placement Postextraction. J Periodontol [Internet]. 2011 Mar 1;82(3):342-9. Available from: <https://doi.org/10.1902/jop.2010.100408>
12. Tarnow DP, Cho SC, Wallace SS. The Effect of Inter-Implant Distance on the Height of Inter-Implant Bone Crest. J Periodontol [Internet]. 2000 Apr 1;71(4):546-9. Available from: <https://doi.org/10.1902/jop.2000.71.4.546>
13. Hermann JS, Schoolfield JD, Schenk RK, Buser D, Cochran DL. Influence of the Size of the Microgap on Crestal Bone Changes Around Titanium Implants. A Histometric Evaluation of Unloaded Non-Submerged Implants in the Canine Mandible. J Periodontol [Internet]. 2001 Oct 1;72(10):1372-83. Available from: <https://doi.org/10.1902/jop.2001.72.10.1372>

14. D'haese J, Ackhurst J, Wismeijer D, De Bruyn H, Tahmaseb A. Current state of the art of computer-guided implant surgery. *Periodontol 2000* [Internet]. 2017 Feb 1;73(1):121–33. Available from: <https://doi.org/10.1111/prd.12175>
15. Tahmaseb A, Wismeijer D, Coucke W, Derksen W. Computer Technology Applications in Surgical Implant Dentistry: A Systematic Review. *Int J Oral Maxillofac Implants*. 2014;29(Supplement):25–42.
16. Petrikowski CG, Pharoah MJ, Schmitt A. Presurgical radiographic assessment for implants. *J Prosthet Dent* [Internet]. 1989;61(1):59–64. Available from: <https://www.sciencedirect.com/science/article/pii/0022391389901108>
17. Babbush CA. Provisional Implants: Surgical and Prosthetic Aspects. *Implant Dent* [Internet]. 2001;10(2). Available from: [https://journals.lww.com/implantdent/Fulltext/2001/04000/Provisional\\_Implants\\_\\_Surgical\\_and\\_Prosthetic.7.aspx](https://journals.lww.com/implantdent/Fulltext/2001/04000/Provisional_Implants__Surgical_and_Prosthetic.7.aspx)
18. Joda T, Gallucci GO. The virtual patient in dental medicine. *Clin Oral Implants Res*. 2015;26(6):725–6.
19. Stumpel LJ 3rd. Cast-based guided implant placement: a novel technique. *J Prosthet Dent*. 2008 Jul;100(1):61–9.
20. Cehreli MC, Aslan Y, Sahin S. Bilaminar dual-purpose stent for placement of dental implants. *J Prosthet Dent*. 2000 Jul;84(1):55–8.
21. Cehreli MC, Caliş AC, Sahin S. A dual-purpose guide for optimum placement of dental implants. *J Prosthet Dent*. 2002 Dec;88(6):640–3.
22. Lal K, White GS, Morea DN, Wright RF. Use of stereolithographic templates for surgical and prosthodontic implant planning and placement. Part I. The concept. *J Prosthodont Off J Am Coll Prosthodont*. 2006;15(1):51–8.
23. D'Souza KM, Aras MA. Types of implant surgical guides in dentistry: a review. *J Oral Implantol*. 2012 Oct;38(5):643–52.
24. Ramasamy M, Giri, Raja R, Subramonian, Karthik, Narendrakumar R. Implant surgical guides: From the past to the present. *J Pharm Bioallied Sci*. 2013 Jun;5(Suppl 1):S98–102.
25. Kola MZ, Shah AH, Khalil HS, Rabah AM, Harby NMH, Sabra SA, et al. Surgical templates for dental implant positioning; current knowledge and clinical perspectives. *Niger J Surg Off Publ Niger Surg Res Soc*. 2015;21(1):1–5.
26. Burns DR, Crabtree DG, Bell DH. Template for positioning and angulation of intraosseous implants. *J Prosthet Dent*. 1988 Oct;60(4):479–83.
27. Zinner ID, Small SA, Panno F V. Presurgical prosthetics and surgical templates. *Dent Clin North Am*. 1989 Oct;33(4):619–33.
28. Borrow JW, Smith JP. Stent marker materials for computerized tomograph-assisted implant planning. *Int J Periodontics Restorative Dent*. 1996 Feb;16(1):60–7.
29. Espinosa Marino J, Alvarez Arenal A, Pardo Ceballos A, Fernandez Vazquez JP, Ibaseta Diaz G. Fabrication of an implant radiologic-surgical stent for the partially edentulous patient. *Quintessence Int*. 1995 Feb;26(2):111–4.
30. Engelman MJ, Sorensen JA, Moy P. Optimum placement of osseointegrated implants. *J Prosthet Dent*. 1988 Apr;59(4):467–73.
31. Kraut RA. Interactive radiologic diagnosis and case planning for implants. Vol. 5, *Dental implantology update*. United States; 1994. p. 49–55.
32. Edge MJ. Surgical placement guide for use with osseointegrated implants. *J Prosthet Dent*. 1987 Jun;57(6):719–22.
33. Nikzad S, Azari A. A novel stereolithographic surgical guide template for planning treatment involving a mandibular dental implant. *J oral Maxillofac Surg Off J Am Assoc Oral Maxillofac Surg*. 2008 Jul;66(7):1446–54.
34. Oh W-S, Saglik B. Use of a thermoplastic vacuum-formed matrix for secure engagement of an implant surgical template. *J Prosthet Dent*. 2008 Oct;100(4):326–7.

35. Horwitz J, Zuabi O, Machtei EE. Accuracy of a computerized tomography-guided template-assisted implant placement system: an in vitro study. *Clin Oral Implants Res.* 2009 Oct;20(10):1156–62.
36. Komiyama A, Klinge B, Hultin M. Treatment outcome of immediately loaded implants installed in edentulous jaws following computer-assisted virtual treatment planning and flapless surgery. *Clin Oral Implants Res.* 2008 Jul;19(7):677–85.
37. Jung RE, Schneider D, Ganeles J, Wismeijer D, Zwahlen M, Hämmerle CHF, et al. Computer technology applications in surgical implant dentistry: a systematic review. *Int J Oral Maxillofac Implants.* 2009;24 Suppl:92–109.
38. Di Giacomo GAP, Cury PR, de Araujo NS, Sendyk WR, Sendyk CL. Clinical application of stereolithographic surgical guides for implant placement: preliminary results. *J Periodontol.* 2005 Apr;76(4):503–7.
39. De Bruyn H, Atashkadeh M, Cosyn J, van de Velde T. Clinical outcome and bone preservation of single TiUnite™ implants installed with flapless or flap surgery. *Clin Implant Dent Relat Res.* 2011 Sep;13(3):175–83.
40. Johansson B, Friberg B, Nilson H. Digitally Planned, Immediately Loaded Dental Implants with Prefabricated Prostheses in the Reconstruction of Edentulous Maxillae: A 1-Year Prospective, Multicenter Study. *Clin Implant Dent Relat Res [Internet].* 2009 Sep 1;11(3):194–200. Available from: <https://doi.org/10.1111/j.1708-8208.2008.00111.x>
41. Gallucci GO, Benic GI, Eckert SE, Papaspyridakos P, Schimmel M, Schrott A, et al. Consensus statements and clinical recommendations for implant loading protocols. *Int J Oral Maxillofac Implants.* 2014;29 Suppl:287–90.
42. D'haese J, Van De Velde T, Elaut L, De Bruyn H. A Prospective Study on the Accuracy of Mucosally Supported Stereolithographic Surgical Guides in Fully Edentulous Maxillae. *Clin Implant Dent Relat Res [Internet].* 2012 Apr 1;14(2):293–303. Available from: <https://doi.org/10.1111/j.1708-8208.2009.00255.x>
43. D'haese J, Van De Velde T, Komiyama A, Hultin M, De Bruyn H. Accuracy and Complications Using Computer-Designed Stereolithographic Surgical Guides for Oral Rehabilitation by Means of Dental Implants: A Review of the Literature. *Clin Implant Dent Relat Res [Internet].* 2012 Jun 1;14(3):321–35. Available from: <https://doi.org/10.1111/j.1708-8208.2010.00275.x>
44. Lin G-H, Chan H-L, Bashutski JD, Oh T-J, Wang H-L. The effect of flapless surgery on implant survival and marginal bone level: a systematic review and meta-analysis. *J Periodontol.* 2014 May;85(5):e91–103.
45. Moraschini V, Velloso G, Luz D, Barboza EP. Implant survival rates, marginal bone level changes, and complications in full-mouth rehabilitation with flapless computer-guided surgery: a systematic review and meta-analysis. *Int J Oral Maxillofac Surg.* 2015 Jul;44(7):892–901.
46. Voulgarakis A, Strub JR, Att W. Outcomes of implants placed with three different flapless surgical procedures: a systematic review. *Int J Oral Maxillofac Surg.* 2014 Apr;43(4):476–86.
47. Moore JR. A modification of stent design for preprosthetic surgery. *J Oral Surg.* 1970 Apr;28(4):263–6.
48. Firtell DN, Oatis GW, Curtis TA, Sugg WEJ. A stent for a split-thickness skin graft vestibuloplasty. *J Prosthet Dent.* 1976 Aug;36(2):204–10.
49. Bouri AJ, Bissada N, Al-Zahrani MS, Faddoul F, Nouneh I. Width of keratinized gingiva and the health status of the supporting tissues around dental implants. *Int J Oral Maxillofac Implants.* 2008;23(2):323–6.
50. Sennerby L, Andersson P, Pagliani L, Giani C, Moretti G, Molinari M, et al. Evaluation of a Novel Cone Beam Computed Tomography Scanner for Bone Density Examinations in Preoperative 3D Reconstructions and Correlation with Primary Implant Stability. *Clin Implant Dent Relat Res.* 2015 Oct;17(5):844–53.
51. Joda T, Derksen W, Wittneben JG, Kuehl S. Static computer-aided implant surgery (s-CAIS) analysing patient-reported outcome measures (PROMs), economics and surgical complicati-

- ons: A systematic review. Clin Oral Implants Res [Internet]. 2018 Oct 1;29(S16):359–73. Available from: <https://doi.org/10.1111/clr.13136>
52. Flügge T, van der Meer WJ, Gonzalez BG, Vach K, Wismeijer D, Wang P. The accuracy of different dental impression techniques for implant-supported dental prostheses: A systematic review and meta-analysis. Clin Oral Implants Res [Internet]. 2018 Oct 1;29(S16):374–92. Available from: <https://doi.org/10.1111/clr.13273>
  53. Fokas G, Vaughn VM, Scarfe WC, Bornstein MM. Accuracy of linear measurements on CBCT images related to presurgical implant treatment planning: A systematic review. Clin Oral Implants Res [Internet]. 2018 Oct 1;29(S16):393–415. Available from: <https://doi.org/10.1111/clr.13142>