BÖLÜM 6

ORTODONTİDE İSKELETSEL ANKRAJ: İNFRAZİGOMATİK KREST VİDASI

Onur ÖCAL[1]
Ahmet YAĞCI[2]

GİRİŞ

Graber, ankrajı "diş hareketini sağlamak amacıyla kullanılan anatomik bir birimin yer değiştirmeye karşı gösterdiği direnç düzeyi ve niteliği" olarak tanımlamıştır (1). Bu tanım, Newton'un üçüncü hareket yasasına dayanmakta olup maloklüzyonların başarılı ortodontik tedavisinde temel bir gerekliliktir (2, 3)

Geçici ankraj cihazları, "reaktif ünitedeki dişleri destekleyerek ya da bu ünitenin gerekliliğini tamamen ortadan kaldırarak ortodontik ankrajı artırmak amacıyla kemiğe geçici olarak sabitlenen ve kullanımı sonrasında çıkarılan cihazlardır."(4). Geçici ankraj cihazları (TAD'ler) ortodontik kliniklerde oldukça faydalı olan mutlak ankraj sistemleri sağlar. Birkaç araştırmacı (5-8), infrazigomatik krest bölgesinin geçici ankraj cihazları (TAD) için ideal bir yer olduğunu belirtmiştir.

İNFRAZİGOMATİK KREST VİDASI

Anatomik olarak infrazigomatik krest (IZC), zigoma kemiğinden molar bölgeye doğru uzanan ve kortikal kemiğin kalınlaştığı güçlü bir yapıdır. Maksiller tüberozitenin önünde, elle hissedilebilen kemiksi bir çıkıntı şeklindedir. Daha genç bireylerde ikinci premolar ve birinci molar arasında görülse de yetişkinlerde birinci molar dişin üzerindedir (9).

İntra-alveolar TAD'lerin aksine, infrazigomatik krest (IZC) bölgesine yerleştirilen ekstra-alveolar TAD'lerin spesifik endikasyonları bulunmaktadır. Bu tip

[1] Arş. Gör., Erciyes Üniversitesi Diş Hekimliği Fakültesi, Ortodonti AD., dtonurocal@gmail.com, ORCID iD: 0009-0009-5988-8511
[2] Prof. Dr., Erciyes Üniversitesi Diş Hekimliği Fakültesi, Ortodonti AD., dtahmetyagci@gmail.com, ORCID iD: 0000-0002-8962-8392

DOI: 10.37609/akya.3843.c1172

Mini vida fraktüründen kaçınmak için tavsiye edilen minimum çap 1,5 mm'dir, daha ince vidalar kırılma riskini artırabilir. Çapı 1,2 mm'den küçük vidalar >10 Ncm kuvvetlerle kırılma ihtimali çok yüksektir (37).

SONUÇ

İnfrazigomatik krest (IZC) bölgesi, maksillanın posterolateral yüzeyinde, zigomatik kemikle maksilla arasındaki birleşim hattının hemen inferiorunda yer alan, yoğun kortikal kemik yapısıyla karakterize anatomik bir alandır. Bu bölge, genellikle maksiller birinci ve ikinci molar dişlerin apikaline karşılık gelir ve lateral maksiller sinüs duvarına yakın konumlanmıştır. IZC bölgesinin ortodontik uygulamalardaki önemi, diş köklerinden uzak olması, kortikal kemik kalınlığının nispeten fazla olması ve biyomekanik açıdan güçlü bir ankraj sunmasıdır.

İnfrazigomatik krest (IZC) vidası, özellikle maksiller dişlerin distalizasyonu ve total ark retraksiyonu gibi yüksek düzeyde ankraj gerektiren durumlarda etkili ve güvenilir bir ortodontik ankraj kaynağı olarak öne çıkmaktadır. IZC vidasının yerleşim yerinin diş köklerinden uzak olması nedeniyle kök perforasyonu riskini minimal düzeye indirir ve başarı oranı oldukça yüksek ve klinik etkinliği kanıtlanmıştır. Bu bağlamda, IZC vidaları ortodontik tedavilerde güvenli, etkili ve biyolojik olarak avantajlı bir ekstra-alveolar ankraj seçeneği olarak değerlendirilmelidir.

KAYNAKLAR

1. Graber TM. Orthodontics principles and practice. Growth and development. 1972:27-128.
2. Turley P, Kean C, Schur J, Stefanac J, Gray J, Hennes J, et al. Orthodontic force application to titanium endosseous implants. The Angle Orthodontist. 1988;58(2):151-62.
3. Papadopoulos MA. Overview of the intra-maxillary noncompliance appliances with absolute anchorage. Orthodontic treatment for the Class II non-compliant patient: current principles and techniques. 2006:341-4.
4. Cope JB, editor Temporary anchorage devices in orthodontics: a paradigm shift. Seminars in orthodontics; 2005: Elsevier.
5. de Almeida MR, de Almeida RR, Nanda R. Biomecânica dos mini-implantes inseridos na região de crista infrazigomática para correção da má oclusão de Classe II subdivisão. Revista Clínica de Ortodontia Dental Press. 2016;15(6).
6. Almeida MR. Biomecânica de distalização dentoalveolar com mini-implantes extra-alveolares em paciente Classe I com biprotrusão. Rev Clín Ortod Dental Press. 2017;16(6):61-76.
7. Costa A, Raffainl M, Melsen B. Miniscrews as orthodontic anchorage: a preliminary report. The International journal of adult orthodontics and orthognathic surgery. 1998;13(3):201-9.
8. Chang C. Clinical applications of orthodontic bone screw in Beethoven Orthodontic Center. Int J Orthod Implantol. 2011;23:50-1.
9. Wu X, Liu H, Luo C, Li Y, Ding Y. Three-dimensional evaluation on the effect of maxillary dentition distalization with miniscrews implanted in the infrazygomatic crest. Implant dentistry. 2018;27(1):22-7.
10. de Almeida MR. The biomechanics of extra- alveolar TADs in orthodontics. Temporary ancho-

rage devices in clinical orthodontics. 2020:445-54.
11. Chang C, Huang C, Roberts WE. 3D cortical bone anatomy of the mandibular buccal shelf: a CBCT study to define sites for extra-alveolar bone screws to treat Class III malocclusion. Int J Orthod Implantol. 2016;41(1):74-82.
12. Brown RN, Sexton BE, Chu T-MG, Katona TR, Stewart KT, Kyung H-M, et al. Comparison of stainless steel and titanium alloy orthodontic miniscrew implants: a mechanical and histologic analysis. American Journal of Orthodontics and Dentofacial Orthopedics. 2014;145(4):496-504.
13. Chang CC, Lin JS, Yeh H. Extra-alveolar bone screws for conservative correction of severe malocclusion without extractions or orthognathic surgery. Current osteoporosis reports. 2018;16:387-94.
14. de Almeida MR. Mini-implantes extra-alveolares no tratamento das assimetrias e m Ortodontia. Revista Clínica de Ortodontia Dental Press. 2018;17(3).
15. Liou EJ, Chen P-H, Wang Y-C, Lin JC-Y. A computed tomographic image study on the thickness of the infrazygomatic crest of the maxilla and its clinical implications for miniscrew insertion. American journal of orthodontics and dentofacial orthopedics. 2007;131(3):352-6.
16. Currier F, Kadioglu O. The Orthodontist's Role in MDI Therapeutics: ORTHO Transitional Anchorage Devices (TADs) and Related Applications. Mini Dental Implants: Elsevier; 2013. p. 211-34.
17. Cheng S-J, Tseng I-Y, Lee J-J, Kok S-H. A prospective study of the risk factors associated with failure of mini-implants used for orthodontic anchorage. International Journal of Oral & Maxillofacial Implants. 2004;19(1).
18. Graham J, Cope J. Potential complications with OrthoTADs: classification, prevention, and treatment. OrthoTADs: the clinical guide and atlas Dallas: Under Dog Media LP. 2007:119-34.
19. Marquezan M, Mattos CT, Sant'Anna EF, de Souza MMG, Maia LC. Does cortical thickness influence the primary stability of miniscrews?: a systematic review and meta-analysis. The Angle Orthodontist. 2014;84(6):1093-103.
20. Lin JJ-J, White LW. Creative orthodontics: blending the Damon System & TADs to manage difficult malocclusions: Yong Chieh Company; 2007.
21. Morarend C, Qian F, Marshall SD, Southard KA, Grosland NM, Morgan TA, et al. Effect of screw diameter on orthodontic skeletal anchorage. American Journal of Orthodontics and Dentofacial Orthopedics. 2009;136(2):224-9.
22. DeCoster TA, Heetderks DB, Downey DJ, Ferries JS, Jones W. Optimizing bone screw pullout force. J Orthop Trauma. 1990;4(2):169-74.
23. Papadopoulos MA. Skeletal anchorage in orthodontic treatment of class ii malocclusion. Journal of Orthodontics. 2015;42(1):87-.
24. Park H-S, Jeong S-H, Kwon O-W. Factors affecting the clinical success of screw implants used as orthodontic anchorage. American Journal of Orthodontics and Dentofacial Orthopedics. 2006;130(1):18-25.
25. Tseng Y-C, Hsieh C-H, Chen C-H, Shen Y-S, Huang I-Y, Chen C-M. The application of mini-implants for orthodontic anchorage. International journal of oral and maxillofacial surgery. 2006;35(8):704-7.
26. Yao C-CJ, Chang H-H, Chang JZ-C, Lai H-H, Lu S-C, Chen Y-J. Revisiting the stability of mini-implants used for orthodontic anchorage. Journal of the Formosan Medical Association. 2015;114(11):1122-8.
27. Lemieux G, Hart A, Cheretakis C, Goodmurphy C, Trexler S, McGary C, et al. Computed tomographic characterization of mini-implant placement pattern and maximum anchorage force in human cadavers. American journal of orthodontics and dentofacial orthopedics. 2011;140(3):356-65.
28. Chen C-H, Chang C-S, Hsieh C-H, Tseng Y-C, Shen Y-S, Huang I-Y, et al. The use of microimplants in orthodontic anchorage. Journal of Oral and Maxillofacial Surgery. 2006;64(8):1209-13.
29. Pithon MM, Figueiredo DSF, Oliveira DD. Mechanical evaluation of orthodontic mini-imp-

lants of different lengths. Journal of Oral and Maxillofacial Surgery. 2013;71(3):479-86.
30. Sarul M, Minch L, Park H-S, Antoszewska-Smith J. Effect of the length of orthodontic mini-screw implants on their long-term stability: a prospective study. The Angle Orthodontist. 2015;85(1):33-8.
31. Chang C, Liu SS, Roberts WE. Primary failure rate for 1680 extra-alveolar mandibular buccal shelf mini-screws placed in movable mucosa or attached gingiva. The Angle Orthodontist. 2015;85(6):905-10.
32. Chang CH, Lin JS, Roberts WE. Failure rates for stainless steel versus titanium alloy infrazygomatic crest bone screws: A single-center, randomized double-blind clinical trial. The Angle Orthodontist. 2019;89(1):40-6.
33. Kuroda S, Sugawara Y, Deguchi T, Kyung H-M, Takano-Yamamoto T. Clinical use of miniscrew implants as orthodontic anchorage: success rates and postoperative discomfort. American journal of orthodontics and dentofacial orthopedics. 2007;131(1):9-15.
34. Yi J, Ge M, Li M, Li C, Li Y, Li X, et al. Comparison of the success rate between self-drilling and self-tapping miniscrews: a systematic review and meta-analysis. European Journal of Orthodontics. 2017;39(3):287-93.
35. Motoyoshi M, Yoshida T, Ono A, Shimizu N. Effect of cortical bone thickness and implant placement torque on stability of orthodontic mini-implants. International Journal of Oral & Maxillofacial Implants. 2007;22(5).
36. Hsu E, Lin J, Yeh H, Chang C, Roberts W. Comparison of the failure rate for infrazygomatic bone screws placed in movable mucosa or attached gingiva. Int J Orthod Implantol. 2017;47(1):96-106.
37. Romero-Delmastro AA, Kadioglu O, Currier GF. Considerations for the Placement of TADs. Temporary Anchorage Devices in Clinical Orthodontics. 2020:83-9.
38. Pan Y, Wei L, Zheng Z, Bi W. An evaluation of bone depth at different three-dimensional paths in infrazygomatic crest region for miniscrew insertion: A cone beam computed tomography study. Heliyon. 2024;10(3).
39. Kravitz ND, Kusnoto B. Risks and complications of orthodontic miniscrews. American Journal of Orthodontics and Dentofacial Orthopedics. 2007;131(4):S43-S51.
40. Sandeep S, Katheesa P. An overview of extra alveolar bone screws-IZC/BS screws. Biomedicine. 2020;40(2):108-10.
41. Chang CH, Lin J-H, Roberts WE. Success of infrazygomatic crest bone screws: patient age, insertion angle, sinus penetration, and terminal insertion torque. American Journal of Orthodontics and Dentofacial Orthopedics. 2022;161(6):783-90.
42. Rosa WGN, de Almeida-Pedrin RR, Oltramari PVP, de Castro Conti ACF, Poleti TMFF, Shroff B, et al. Total arch maxillary distalization using infrazygomatic crest miniscrews in the treatment of Class II malocclusion: a prospective study. The Angle Orthodontist. 2023;93(1):41-8.
43. Almeida MRd. Mini-implantes extra-alveolares em Ortodontia. Editora: Dental Press Maringá. 2018.
44. Motoyoshi M, Matsuoka M, Shimizu N. Application of orthodontic mini-implants in adolescents. International journal of oral and maxillofacial surgery. 2007;36(8):695-9.
45. Nucera R, Lo Giudice A, Bellocchio AM, Spinuzza P, Caprioglio A, Perillo L, et al. Bone and cortical bone thickness of mandibular buccal shelf for mini-screw insertion in adults. The Angle orthodontist. 2017;87(5):745-51.
46. Elshebiny T, Palomo JM, Baumgaertel S. Anatomic assessment of the mandibular buccal shelf for miniscrew insertion in white patients. American Journal of Orthodontics and Dentofacial Orthopedics. 2018;153(4):505-11.
47. Gill G, Shashidhar K, Kuttappa M, PB DK, Sivamurthy G, Mallick S. Failure rates and factors associated with infrazygomatic crestal orthodontic implants-A prospective study. Journal of Oral Biology and Craniofacial Research. 2023;13(2):283-9.
48. Manni A, Cozzani M, Tamborrino F, De Rinaldis S, Menini A. Factors influencing the stability of miniscrews. A retrospective study on 300 miniscrews. The European Journal of Orthodonti-

cs. 2011;33(4):388-95.
49. Chen YJ, Chang HH, Huang CY, Hung HC, Lai EHH, Yao CCJ. A retrospective analysis of the failure rate of three different orthodontic skeletal anchorage systems. Clinical oral implants research. 2007;18(6):768-75.
50. Chung K-R, Kim S-H, Kook Y-A. The C-orthodontic micro-implant. Journal of clinical orthodontics: JCO. 2004;38(9):478-86; quiz 87.
51. Pragya P, Riyaz K, Karande V, Chavan V, Shinde RK, Medhi P, et al. Predictors of Infrazygomatic Crest Implant Failure: A Prospective Study on Risk Factors, Stability, and Clinical Outcomes in Orthodontic Anchorage. Cureus. 2025;17(4).
52. Papageorgiou SN, Zogakis IP, Papadopoulos MA. Failure rates and associated risk factors of orthodontic miniscrew implants: a meta-analysis. American Journal of Orthodontics and Dentofacial Orthopedics. 2012;142(5):577-95. e7.
53. Jia X, Chen X, Huang X. Influence of orthodontic mini-implant penetration of the maxillary sinus in the infrazygomatic crest region. American Journal of Orthodontics and Dentofacial Orthopedics. 2018;153(5):656-61.
54. Uribe F, Mehr R, Mathur A, Janakiraman N, Allareddy V. Failure rates of mini-implants placed in the infrazygomatic region. Progress in orthodontics. 2015;16:1-6.
55. Motoyoshi M, Sanuki-Suzuki R, Uchida Y, Saiki A, Shimizu N. Maxillary sinus perforation by orthodontic anchor screws. Journal of Oral Science. 2015;57(2):95-100.
56. Creekmore TD. The possibility of skeletal anchorage. J clin Orthod. 1983;17:266-9.
57. Baumgaertel S, Hans MG. Assessment of infrazygomatic bone depth for mini-screw insertion. Clinical oral implants research. 2009;20(6):638-42.
58. Sung J, Kyung H, Bae S, Park H, Kwon O, McNamara Jr J. Microimplants in Orthodontics. Daegu: Dentos. Inc; 2006.
59. Kadioglu O, Büyükyilmaz T, Zachrisson BU, Maino BG. Contact damage to root surfaces of premolars touching miniscrews during orthodontic treatment. American journal of orthodontics and dentofacial orthopedics. 2008;134(3):353-60.
60. Asscherickx K, Vannet BV, Wehrbein H, Sabzevar MM. Root repair after injury from mini-screw. Clinical oral implants research. 2005;16(5):575-8.
61. Lee K-J, Joo E, Kim K-D, Lee J-S, Park Y-C, Yu H-S. Computed tomographic analysis of tooth-bearing alveolar bone for orthodontic miniscrew placement. American Journal of Orthodontics and Dentofacial Orthopedics. 2009;135(4):486-94.