

Giriş

Alveoler yarıkların, tüm yarıklı hastaların %75’inde bulunduğu bildirilmektedir (1). Alveoler kemik grefti uygulaması dudak damak yarıklı hastalarda yaygın olarak kullanılan bir yöntem olup, dudak damak yarıklı hastalarda yarıklı alveoler bölgeyi onarma prosedürü olarak adlandırılmıştır. Bu cerrahi prosedür, yarık bulunan maksiller arkın bütünlüğünün sağlanması, alveoldeki çentigin giderilmesi ve o bölgedeki kemik hacminin arttırılması amacıyla yapılmaktadır. Özellikle yarık tarafındaki dişlerin periodontal desteklerinin sağlanması ve sürmemiş kanin veya lateral dişlerin yeni oluşan kemiğin içine doğru sürmelerinin sağlanması hedeflerden biridir. Yarık bölgesinde yeni kemik dokusunun oluşturulması ya da bölgedeki kemik hacminin artırılması, sürmüş ya da sürmemiş dişlerin yarık hattına doğru ortodontik olarak hareketini de mümkün kılar. Eğer bu bölgedeki dişlerin yarıya doğru boşluğu kapatması istenmiyorsa da, daha ileriki zamanlarda lateral diş boşluğuna da dental implant uygulanmasına imkan sağlar. Diğer taraf- tan mevcut bir oronazal fistül varsa bunun kapanmasını sağlar ve hem bu bölgede nazal ve alar tabanın oluşturulmasını, hem de nazal tabanda destek görevi görerek bu bölge estetiğine katkıda bulunulmasını sağlar (2-7). Graftleme prosedürünün diğer bir avantajı da oronazal fistülün kapatılmasını sağladığından konușma üzere de pozitif etkisi bulunmaktadır (8). Tüm bu gereklilikler ve avantajlar göz önüne alındığında, alveoler yarık graftlemesinin dudak damak yarıklı bireylerde tedavi yönetiminde önemli bir yeri olduğu kabul edilmektedir. Rutrick ve ark. graftlemenin diğer bazı durumlarda da gerektiğini vurgulamış ve bunlardan birinin de ortopedik tedavi uygulanmış vakalarda stabil olmayan (graftlenmemiş) maksiller arkaların kayması ve elde edilen etkinin kaybedilmesini önlemek olduğunu belirtmiştir (2). Isırma sırasında da stabilite sağlamak ve eğer ortognatik cerrahi planlanıyorsa tek aşamalı cerrahi uygulayabilmek için de graftleme prosedürü gerekli olmaktadır (2). Bu hemen elde edilen etkilerin yanı sıra, zamanlama-

Kaynakça

1. Guo J, Li C, Zhang Q, et al: Secondary bone grafting for alveolar cleft in children with cleft lip or cleft lip and palate. Cochrane Database Syst Rev 6:CD008050, 2011
2. Rutrick R., Cohen S., Black P.W. et. al. Presurgical Orthopedic Management Of The Unilateral Cleft Lip And Palate Newborn Patient. Operative Techniques in Plastic and Reconstructive Surgery. 1995;2(3): 159-163.
3. Fahradyan A, Tsuha M, Wolfswinkel EM. et al. Optimal Timing of Secondary Alveolar Bone Grafting: A Literature Review. J Oral Maxillofac Surg 2019;77:843-849.
4. Abyholm FE, Bergland O, Semb G. Secondary bone grafting of alveolar clefts. Scand J Plast Reconstr Surg Hand Surg. 1981;15:127-140.
5. Boyne PJ, Sands NR. Secondary bone grafting of residual alveolar and palatal clefts. J Oral Surg. 1972;30:87-92.
6. Bergland O, Semb G, Abyholm FE. Elimination of the residual alveolar cleft by secondary bone grafting and subsequent orthodontic treatment. Cleft Palate J. 1986;23:175-205.
7. nemark H, Simonsen EK, Schramm JE. Secondary bone grafting in unilateral cleft lip palate patients. Indication and treatment procedure. Int J Oral Surg. 1985;14:2-10.
8. Fudalej P, Janiszewska-Olszowska J, Wedrychowska-Szulc B, et. al. Early alveolar bone grafting has a negative effect on maxillary dental arch dimensions of pre school children with complete unilateral cleft lip and palate. Orthod Craniofac Res.2011;14(2):51-57.
9. da Silva Filho OG, Teles SG, Ozawa TO, et al. Secondary bone graft and eruption of the permanent canine in patients with alveolar clefts: literature review and case report. Angle Orthod. 2000;70:174-178.
10. Friede H, Johanson B. Adolescent facial morphology of early bone-grafted cleft lip and palate patients. Scand J Plast Reconstr Surg. 1982;16(1):41-53.
11. Meazzini MC, Rossetti G, Garattini G, et al. Early secondary gingivoalveoplasty in the treatment of unilateral cleft lip and palate patients: 20 years' experience. J Craniomaxillofac Surg. 2010;38:185-194.
12. Lilja J, Kalaaji A, Friede H, et al. Combined bone grafting and delayed closure of the hard palate in patients with unilateral cleft lip and palate: facilitation of lateral incisor eruption and evaluation of indicators for timing of the procedure. Cleft Palate Craniofac J. 2000;37:98-105.
13. Rosenstein SW, Dado DV, Kernahan DA, Griffith BH, Grassechi M: The case for early bone grafting in cleft lip and palate. Plast Reconstr Surg 1991;87: 644-654.
14. Oberoi S, Gill P, Chigurupati R, et al. Three-dimensional assessment of the eruption path of the canine in individuals with bone-grafted alveolar clefts using cone beam computed tomography. Cleft Palate Craniofac J. 2010;47:507-512.
15. Freihofer HP, Borstlap WA, Kuijpers Jagtman AM et al. Timing and transplant materials for closure of alveolar clefts. A clinical comparison of 296 cases. J Craniomaxillofac Surg. 1993;21:143-148.
16. Precious DS. A new reliable method for alveolar bone grafting at about 6 years of age. J Oral Maxillofac Surg. 2009;67:2045-2053.
17. Miller LL, Kauffmann D, St. John D, et al. Retrospective review of 99 patients with secondary alveolar cleft repair. J Oral Maxillofac Surg. 2010;68:1283-1289.
18. Williams A, Semb G, Beam D, et al. Prediction of outcomes of secondary alveolar bone grafting in children born with unilateral cleft lip and palate. Eur J Orthod 2003;25:205-211.

19. Tabrizi R, Zamiri B, Daneste H, et al. Outcome of bone availability after secondary alveolar bone graft in two age groups. *J Craniofac Surg* 2013;24:e565–e567.
20. Dissaux C, Bodin F, Grollemund B, et al. Evaluation of success of alveolar cleft bone graft performed at 5 years versus 10 years of age. *J Craniomaxillofac Surg* 2016;44:21–26.
21. Sindet-Pedersen S, Enemark H. Comparative study of secondary and late secondary bone-grafting in patients with residual cleft defects. Short-term evaluation. *Int J Oral Surg* 1985;14:389–398.
22. Garcia MA, Yatabe M, Fuzer TU, et al. Ideal versus late secondary alveolar bone graft surgery: a bone-thickness cone-beam computed tomographic assessment. *Cleft Palate Craniofac J*. 2018;55:369-374.
23. Friede H, Enemark H. Long term evidence for favorable midfacial growth after delayed hard palate repair in UCLP patients. *Cleft Palate Craniofac J*. 2001;38:323-329.
24. Brudnicki A, Sawicka E, Brudnicka R. et.al. Effects of Different Timing of Alveolar Bone Graft on Craniofacial Morphology in Unilateral Cleft Lip and Palate. *Cleft Palate Craniofac J*. 2020;57(1):105-113.
25. Seo J, Kim S, Hyung Yang D. et al. Effect of Secondary Alveolar Bone Grafting on the Maxillary Growth: Unilateral Versus Bilateral Cleft Lip and Palate. Patients. *J Craniofac Surg* 2015;26: 2128–2132.
26. Levitt T,Long RE Jr,Trotman CA. Maxillary growth in patients with clefts following secondary alveolar bone grafting. -*Cleft Palate Craniofac J*. 1999;36(5):398-406.
27. Tessier P. Autogenous bone grafts taken from the calvarium for facial and cranial applications. *Clin Plast Surg* 1992; 9:531–588.
28. Sindet-Pedersen S, Enemark H. Reconstruction of alveolar clefts with mandibular or iliac crest bone grafts: a comparative study. *J Oral Maxillofac Surg* 1990; 48: 554–558.
29. Kalaaji A, Lilja J, Elander A, Friede H. Tibia as donor site for alveolar bone grafting in patients with cleft lip and palate: long-term experience. *Scand J Plast Reconstr Surg Hand Surg*. 2001;35(1):35-42.
30. Rosenstein SW, Dado DV, Kernahan DA, Griffith BH, Grassechi M: The case for early bone grafting in cleft lip and palate. *Plast Reconstr Surg* 1991;87: 644-654.
31. So L, Lui W. Alternative donor site for alveolar bone grafting in adults with cleft lip and palate. *Angle Orthod*. 1996;69:9-16.
32. Arangio P, Marianetti TM, Tedaldi M, et al. Early secondary alveoloplasty in cleft lip and palate. *J Craniofac Surg*. 2008;19:1364-1369.
33. Eichhorn W, Blessmann M, Pohlenz P, Blake FA, Gehrke G, Schmelze R, Heiland M. Primary osteoplasty using calvarian bone in patients with cleft lip, alveolus and palate. *J Craniomaxillofac Surg*. 2009;37(8):429-33.
34. Han K, Jeong W, Yeo H. Long-term results of secondary alveolar bone grafting using a technique to harvest pure calvarial cancellous bone: Evaluation based on plain radiography and computed tomography. *Journal of Plastic, Reconstructive & Aesthetic Surgery*. 2017;70:352-359.
35. Enemark H, Jensen J, Bosch C. Mandibular bone graft material for reconstruction of alveolar cleft defects: long-term results. *Cleft Palate Craniofac J*. 2001;38:155-163.
36. Linderup BW, Cattaneo PM, Jensen J, et al. Mandibular symphyseal bone graft for reconstruction of alveolar cleft defects: volumetric assessment with cone beam computed tomography 1-year postsurgery. *Cleft Palate Craniofac J*. 2016;53:64-72.
37. Harbi A, Yamani A. Tibial bone graft for alveolar cleft. *Annals of Maxillofacial Surgery*. 2012; 2(2):146-152.

38. Besly W, Ward-Booth P. Technique for harvesting tibial cancellous bone modified for use in children. *Br J Oral Maxillofac.* 1999;37:129-133.
39. van Aalst J, Eppley B, Hathaway R. et al. Surgical Technique for Primary Alveolar Bone Grafting. *The Journal of Craniofacial Surgery* 2005;16(4): 706-711.
40. Dado DV, Rosenstein SW, Alder ME. et. al. Long-term assessment of early alveolar bone grafts using three-dimensional computer-assisted tomography: a pilot study. *Plast Reconstr Surg.* 1997;99(7):1840-1845.
41. Zhou WN, Pan YC, Tang YC et al. Comparative Outcomes of Block and Cancellous Iliac Bone Grafting in Older Unilateral Alveolar Cleft Patients. *Cleft Palate Craniofac J.* 2019;56(7):936-943.
42. Uribe F, Alister JP, Zaror C. et al. Alveolar Cleft Reconstruction Using Morphogenetic Protein (rhBMP-2): A Systematic Review and Meta-Analysis. *Cleft Palate Craniofac J.* 2019. (Basında) doi: 10.1177/1055665619886142
43. Shawky H, Seifeldin SA. Does Platelet-Rich Fibrin Enhance Bone Quality and Quantity of Alveolar Cleft Reconstruction? *The Cleft Palate-Craniofacial Journal* 2016;53(5):597-606.
44. Pan X, Qian Y, Yu J, et al. Biomechanical effects of rapid palatal expansion on the craniofacial skeleton with cleft palate: a three-dimensional finite element analysis. *Cleft Palate Craniofac J.* 2007;44:149-154.
45. Yang CJ, Pan XG, Qian YF, et al. Impact of rapid maxillary expansion in unilateral cleft lip and palate patients after secondary alveolar bone grafting: review and case report. *Oral Surg Oral Med Oral Pathol Oral Radiol.* 2012;114:25-30.
46. Garib D, Miranda F, Sathler R, et al. Rapid maxillary expansion after alveolar bone grafting with rhBMP-2 in UCLP evaluated by means of CBCT. *Cleft Palate Craniofac J.* 2017;54:474-480.
47. Keribin P, Nicholls W, Walters M, et al. A Review of 30 Years of Alveolar Bone Grafting in the Mixed Dentition Using a Standardized Protocol in Western Australia. *Plast Reconstr Surg.* 2020;145:391-400.
48. Seike T, Hashimoto I, Matsumoto K, et al. Early postoperative evaluation of secondary bone grafting into the alveolar cleft and its effects on subsequent orthodontic treatment. *J Med Invest.* 2012;59:152-165.
49. Matsui K, Echigo S, Kimizuka S.A et al. Clinical study on eruption of permanent canines after secondary alveolar bone grafting. *Cleft Palate Craniofac J* 2005;42:309-313.
50. Russell KA, McLeod CE. Canine eruption in patients with complete cleft lip and palate. *Cleft Palate Craniofac J* 2008;45:73-80.
51. Park HM, Han DH, Baek SH. Comparison of tooth development stage of the maxillary anterior teeth before and after secondary alveolar bone graft: Unilateral cleft lip and alveolus vs unilateral cleft lip and palate. *Angle Orthod.* 2014;84(6):989-994.
52. Lindauer, S.J., Rubenstein, L.K., Hang, W.M., Andersen, W.C., Isaacson, R.J., 1992. Canine impaction identified early with panoramic radiographs. *J. Am. Dent. Assoc.* 123, 95–97.
53. Hereman V, Cadenas De Llano-Pérula M, Willemens G, et al. Associated parameters of canine impaction in patients with unilateral cleft lip and palate after secondary alveolar bone grafting: a retrospective study. *Eur J Orthod.* 2018;40:575-582.
54. Kindelan JD, Nashed RR, Bromige MR. Radiographic assessment of secondary autogenous alveolar bone grafting in cleft lip and palate patients. *Cleft Palate Craniofac J.* 1997;34:195-198.

55. Witherow H, Cox S, Jones E, et al. A new scale to assess radiographic success of secondary alveolar bone grafts. *Cleft Palate Craniofac J.* 2002;39:255-260.
56. Nightingale C, Witherow H, Reid FD, et al. Comparative reproducibility of three methods of radiographic assessment of alveolar bone grafting. *Eur J Orthod.* 2003;25:35-41.
57. Van der Meij AJ, Baart JA, Prahl-Andersen B, et al. Computed tomography in evaluation of early secondary bone grafting. *Int J Oral Maxillofac Surg.* 1994;23:132-136.
58. Honma K, Kobayashi T, Nakajima T, et al. Computed tomographic evaluation of bone formation after secondary bone grafting of alveolar clefts. *J Oral Maxillofac Surg.* 1999;57:1209-1213.
59. Jabbari F, Wiklander L, Reiser E, et.al. Secondary Alveolar Bone Grafting in Patients Born With Unilateral Cleft Lip and Palate: A 20-Year Follow-up The Cleft Palate-Craniofacial Journal 2018, 55(2) 173-179.
60. Feichtinger M, Mossböck R, Kärcher H. Assessment of bone resorption after secondary alveolar bone grafting using threedimensional computed tomography: A three-year study. *Cleft Palate Craniofac J.* 2007;44:142-148.
61. Amirlak B, Tang C, Becker D, et al. Volumetric analysis of simulated alveolar cleft defects and bone grafts using cone beam computed tomography. *J Plast Reconstr Surg.* 2013;131:854-859.
62. Zhou WN, Xu YB, Jiang HB, et al. Accurate Evaluation of Cone-Beam Computed Tomography to Volumetrically Assess Bone Grafting in Alveolar Cleft Patients. *J Craniomaxillofac Surg.* 2015;26:535-539.
63. Chou PY, Denadai R, Hallac RR, et al. Comparative Volume Analysis of Alveolar Defects by 3D Simulation. *J Clin Med.* 2019;8:1-11.
64. Feichtinger M, Mossböck R, Kärcher H. Evaluation of bone volume following bone grafting in patients with unilateral clefts of lip, alveolus and palate using a CT-guided threedimensional navigation system. *J Craniomaxillofac Surg.* 2006;34:144-149.
65. Janssen NG, Schreurs R, Bittermann GKP, et al. A novel semi-automatic segmentation protocol for volumetric assessment of alveolar cleft grafting procedures. *J Craniomaxillofac Surg.* 2017;45:685-689.
66. Liu B, Chen SX, Li BH, et al. An Accurate Volumetric Analysis Method for Evaluating Outcomes of Alveolar Cleft Reconstruction. *J Craniomaxillofac Surg.* 2020;31:38-41.
67. Datana S, Chattopadhyay PK, Kadu A. Bony bridge resorption after secondary alveolar grafting and correlation with success of orthodontic treatment: A prospective volumetric cone beam computed tomography (CBCT) study. *Med J Armed Forces India.* 2019;75:375-382.
68. Wang YC, Liao YF, Chen PK. Comparative Outcomes of Primary Gingivoperiosteoplasty and Secondary Alveolar Bone Grafting in Patients with Unilateral Cleft Lip and Palate. *Plast Reconstr Surg.* 2016;137(1):218-227.
69. Sato Y, Grayson BH, Garfinkle JS, et. al. Success rate of gingivoperiosteoplasty with and without secondary bone grafts compared with secondary alveolar bone grafts alone. *Plast Reconstr Surg.* 2008;121(4):1356-1367.
70. Toscano D, Baciliero U, Gracco A, et al. Long-term stability of alveolar bone grafts in cleft palate patients. *Am J Orthod Dentofacial Orthop.* 2012;142:289-299.
71. Enemark H, Jensen J, Bosch C. Mandibular bone graft material for reconstruction of alveolar cleft defects: long-term results. *Cleft Palate Craniofac J.* 2001;38:155-163.

72. Anver TD, Mirzai L, Li P, et al. Long-Term Postoperative Cone-Beam Computed Tomography Analysis of Secondary Bone Grafting in 79 Patients With Unrepaired Alveolar Clefts. *J Oral Maxillofac Surg.* 2019; 25.
73. Meazzini MC,Corno M, Novelli G. et. al. Long Term Computed Tomographic Evaluation of Alveolar Bone Formation in Patients with Unilateral Cleft Lip and Palate after Early Secondary Gingivoalveoplasty. *Plast Reconstr Surg.* 2016;137(2):365e-374e.
74. Kawakami S, Hiura K, Yokozeiki M, et al. Longitudinal evaluation of secondary bone grafting into the alveolar cleft. *Cleft Palate-Craniofac J.* 2003;40:569-576.
75. Tai C, Sutherland I, McFadden L. Prospective analysis of secondary alveolar bone grafting using computed tomography. *J Oral Maxillofac Surg.* 2000;58:1241-1249.
76. Jabbari F, Reiser E, Thor A, et al. Correlations between initial cleft size and dental anomalies in unilateral cleft lip and palate patients after alveolar bone grafting. *Ups J Med Sci.* 2016;121:33-37.
77. Feichtinger M, Zemann W, Mossböck R, et al. Three dimensional evaluation of secondary alveolar bone grafting using a 3D-navigation system based on computed tomography: a two-year follow-up. *Br J Oral Maxillofac Surg.* 2008;46:278-282.
78. Rachmiel A, Emodi O, Guttmacher Z. et. al. Oral and dental restoration of wide alveolar cleft using distraction osteogenesis and temporary anchorage devices. *J Cranio-maxillofac Surg.* 2013;41(8):728-734.
79. Jackson IT: Closure of secondary palatal fistulae with intra-oral tissue and bone grafting. *Br J Plast Surg* 1972;25: 93-105.
80. Kim MJ, Lee JH, Choi JY, Kang N, Lee JH, Choi WJ: Two-stage reconstruction of bilateral alveolar cleft using Y-shaped anterior-based tongue flap and iliac bone graft. *Cleft Palate Craniofac J* 2001;38: 432-437.
81. Yen SLK, Gross J, Wang P, et al. Closure of a large alveolar cleft by bony transport of a posterior segment using orthodontic archwires attached to bone: report of a case. *J Oral Maxillofac Surg* 2001;59:688-691.
82. Mitsugi M, Ito O, Alcalde RE. Maxillary bone transportation in alveolar cleft transport distraction osteogenesis for treatment of alveolar cleft repair. *Br J Plast Surg.* 2005;58(5):619-625.
83. Rachmiel A,Emodi O, Aizenbud D. et.al Two-stage reconstruction of the severely deficient alveolar ridge: bone graft followed by alveolar distraction osteogenesis. *Int J Oral Maxillofac Surg.* 2018;47(1):117-124.
84. Rachmiel A, Emodi O, Aizenbud D. Three-dimensional reconstruction of large secondary alveolar cleft by two-stage distraction. *Cleft Palate Craniofac J.* 2014;51(1):36-42.
85. Craven C, Cole P,Hollier L Jr. et. al. Ensuring success in alveolar bone grafting: a three-dimensional approach. *J Craniofac Surg.* 2007;18(4):855-9.
86. Feng B, Jiang M, Xu X, et al. A new method of volumetric assessment of alveolar bone grafting for cleft patients using cone beam computed tomography. *Oral Surg Oral Med Oral Pathol Oral Radiol.* 2017;124:171-182.
87. Kaura AS, Srinivasa DR, Kasten SJ. Optimal Timing of Alveolar Cleft Bone Grafting for Maxillary Clefts in the Cleft Palate Population. *J Craniofac Surg.* 2018;29:1551-1557.
88. Meazzini MC,Corno M,Novelli G. et. al. Long Term Computed Tomographic Evaluation of Alveolar Bone Formation in Patients with Unilateral Cleft Lip and Palate after Early Secondary Gingivoalveoplasty. - *Plast Reconstr Surg.* 2016;137(2):365e-374e.