

Serhat ŞİBAR
Özgün KILIÇ
Kemal FINDIKÇIOĞLU
Ayşe GÜLŞEN

Giriş

Distraksiyon Osteogenezisi (DO) cerrahi olarak osteotomi ile birbirlerinden ayrılmış olan kemik segmentlerin sabit bir hız ve ritm ile kademeli olarak birbirinden ayrılması sonucunda yeni kemik oluşumunun elde edildiği kompleks bir süreçtir.¹ Tekniğin günümüzde kraniyofasiyal alanda birçok olguda (yarık dudak, damak defomiteleri, mandibula ve kondil rekonstrüksiyonu, dentoalveoler bölge ve segmental kemik defektlerinin rekonstrüksiyonu vb.) kullanımı söz konusudur.

Tarihçe

Tekniğin temelleri Hipokrat dönemine kadar uzanmaktadır.² Ortopedik alandaki ilk uygulama 20. yy başında Codvilla tarafından femoral uzatma amaçlı olmuştur.³ Tekniğin prensiplerinin tam olarak aydınlatılması ise Illizarov tarafından yapılmıştır ve literatürde Illizarov etkisi olarak tanımlanmaktadır.⁴ Bu etkiye göre canlı dokulardaki kademeli distraksiyon ile dokularda aktif büyüme tetiklenmekte ve süreç yeni doku oluşumu ile sonuçlanmaktadır. Tekniğin kraniyofasiyal alandaki kullanımı ise 1973 yılında Synder tarafından deneysel olarak gerçekleştirilirken, ilk klinik uygulama 1992 yılında McCarthy tarafından mikrognati tedavisi amacıyla gerçekleştirilmiştir.⁵⁻⁷

DO ile yeni kemik oluşumunun yanında yumuşak dokularda da (cilt, kas, sinir, damar) tıpkı kemikte olduğu gibi moleküler düzeyde değişiklikler meydana gelerek yeni doku oluşumu gözlenmektedir. Bu yumuşak doku oluşum sürecine ise **Distraksiyon Histogenezisi** adı verilmektedir. Bu sürece ve önemine ileride tekrar değinilecektir.

Kaynakça

1. McCarthy JG. (2014) Craniofacial microsomia and principles of craniofacial distraction. Charles H. Thorne In: Chung KC, Gosain AK, Gurtner GC, Mehrara BJ, Rubin JP, Spear SL. (Eds.), *Grabb and Smith's Plastic Surgery* (7th ed., pp. 241-251). Philadelphia: Lippincott Williams & Wilkins.
2. Samchukov ML, Cherkashin AM, Cope JB. (1999) Distraction osteogenesis: history and biologic basis of new bone formation. In: Lynch SE, Genco RJ, Marx RE (Eds.), *Tissue Engineering: Applications in Maxillofacial Surgery and Periodontics* (pp 131-146) Carol Stream, Quintessence.
3. Codivilla A. On the means of lengthening in the lower limbs, the muscles and tissues which are shortened through deformity. *Am J Orthop Surg* 1905; 2: 353- 357
4. Ilizarov GA. The principles of the Ilizarov method. *Bull Hosp Joint Dis Orthop Inst* 1988; 48: 1-11.
5. Snyder CC, Levine GA, Swanson HM, et al. Mandibular lengthening by gradual distraction. Preliminary report. *Plast Reconstr Surg* 1973; 51: 506-508.
6. McCarthy JG. The role of distraction osteogenesis in the reconstruction of the mandible in unilateral craniofacial microsomia. *Clin Plast Surg* 1994;21: 625- 631.
7. McCarthy JG, Schreiber J, Karp N, et al. Lengthening of the human mandible by gradual distraction. *Plast Reconstr Surg* 1992; 89: 1-8.
8. Natsu SS, Ali I, Alam S, et al. The biology of distraction osteogenesis for correction of mandibular and craniomaxillofacial defects: A review. *Dent Res J (Isfahan)* 2014; 11: 16-26.
9. Cano J, Campo J, Moreno LA, et al. Osteogenic alveolar distraction: a review of the literature. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2006; 101: 11-28.
10. Kazanjian VH. The inter-relation of dentistry and surgery of the face and jaws. *Aust Dent J.* 1948; 52: 336-338.
11. Rachmiel A, Laufer D, Jackson IT, et al. Midface advancement in sheep by gradual distraction: A one year follow up study. *J oral Maxillofac surg.* 1995; 53: 525-529.
12. Ow A, Cheung LK. Bilateral sagittal split osteotomies versus mandibular distraction osteogenesis: a prospective clinical trial comparing inferior alveolar nerve function and complications. *Int J Oral Maxillofac Surg.* 2010; 39: 756-760.
13. Makarov MR, Harper RP, Cope JB, et al. Evaluation of inferior alveolar nerve function during distraction osteogenesis in the dog. *J Oral Maxillofac Surg.* 1998; 56: 1417-1423.
14. Grayson BH, Stucki-McCormick SU, Santiago PE. Vector of device placement and trajectory of mandibular distraction. *J Craniofac Surg.* 1998; 8:473-80.
15. Norholt SE, Pedersen TK, Herlin T. Functional changes following distraction osteogenesis treatment of asymmetric mandibular growth deviation in unilateral juvenile idiopathic arthritis: a prospective study with long-term follow-up. *Int J Oral Maxillofac Surg.* 2013; 42: 329-336.
16. Paes EC, Mink van der Molen AB, Muradin MS, et al. A systematic review on the outcome of mandibular distraction osteogenesis in infants suffering Robin sequence. *Clin Oral Investig.* 2013; 17: 1807-1820.
17. Kisnisci RS, Fowel SD, Epker BN. Distraction osteogenesis in Silver Russell syndrome to expand the mandible. *Am J Orthod Dentofacial Orthop.* 1999; 116: 25-30.
18. Breik O, Umaphysivam K, Tivey D, et al. Mandibular distraction osteogenesis for the management of upper airway obstruction in children with micrognathia: a systematic review. *Int J Oral Maxillofac Surg.* 2016; 45: 769-782.

19. Woodson BT, Hanson PR, Melugin MB, et al. Sequential upper airway changes during mandibular distraction for obstructive sleep apnea. *Otolaryngol Head Neck Surg* 2003; 128:142-4.
20. Smith KS. Pediatric sleep apnea and treatment with distraction osteogenesis. *Ann R Australas Coll Dent Surg* 2000; 15: 163-7
21. Bouchard C, Troulis MJ, Kaban LB. Management of obstructive sleep apnea: role of distraction osteogenesis. *Oral Maxillofac Surg Clin North Am.* 2009; 21: 459-475.
22. Chigurupati R, Massie J, Dargaville P, et al. Internal mandibular distraction to relieve airway obstruction in infants and young children with micrognathia. *Pediatr Pulmonol.* 2004; 37: 230- 235.
23. Swennen GR, Treutlein C, Brachvogel P, et al. Segmental unilateral transpalatal distraction in cleft patients. *J Craniofac Surg.* 2003; 14: 786-790.
24. Scolozzi P. Distraction osteogenesis in the management of severe maxillary hypoplasia in cleft lip and palate patients. *J Craniofac Surg.* 2008; 19: 1199-1214.
25. Polley JW, Figueroa AA. Rigid external distraction: its application in cleft maxillary deformities. *Plast Reconstr Surg.* 1998; 102: 1360-1372.
26. Bousdras VA, Liyanage C, Mars M, et al. Segmental maxillary distraction with a novel device for closure of a wide alveolar cleft. *Ann Maxillofac Surg.* Jan 2014; 4(1):60-3.
27. Chin M. Distraction osteogenesis for dental implants. *Atlas Oral Maxillofac Surg Clin North Am* 1999; 7: 41-63.
28. Jensen OT, Cockrell R, Kuhike L, et al. Anterior maxillary alveolar distraction osteogenesis: a prospective 5-year clinical study. *Int J Oral Maxillofac Implants* 2002; 17: 52-68.
29. Saulacic N, Iizuka T, Martin MS, et al. Alveolar distraction osteogenesis: a systematic review. *Int J Oral Maxillofac Surg.* 2008; 37: 1-7.
30. Block MS, Chang A, Crawford C Mandibular alveolar ridge augmentation in the dog using distraction osteogenesis. *J Oral Maxillofac Surg* 1996; 54: 309-314.
31. Davies J, Turner S, Sandy JR Distraction osteogenesis--a review. *Br Dent J* 1998; 185: 462-467.
32. Tessier P. The definitive plastic surgical treatment of the severe facial deformities of craniofacial dysostosis: Crouzon's and Apert's diseases. *Plast Reconstr Surg.* 1971; 48: 419-442.
33. Posnick JC, Ruiz RL The craniofacial dysostosis syndromes: current surgical thinking and future directions. *Cleft Palate Craniofac J.* 2000; 37: 433-433.
34. Nout E, Cesteley LL, van der Wal KG, et al. Advancement of the midface, from conventional Le Fort III osteotomy to Le Fort III distraction: review of the literature. *Int J Oral Maxillofac Surg.* 2008; 37: 781-789.
35. Molina F. Distraction osteogenesis for the cleft lip and palate patient. *Clin Plast Surgery.* 2004; 31: 291-302.
36. Sándor GK, Ylikontiola LP, Serlo W, et al. Distraction osteogenesis of the midface. *Oral Maxillofac Surg Clin North Am.* 2005; 17: 485-501.
37. Wang XX, Wang X, Yi B, et al. Internal midface distraction in correction of severe maxillary hypoplasia secondary to cleft lip and palate. *Plast Reconstr Surg.* 2005; 116: 51-60.
38. Cheung L, Chua H. A meta-analysis of cleft maxillary osteotomy and distraction osteogenesis. *Int J Oral Maxillofac Surg.* 2006; 35: 14-24.
39. Gürsoy S, Hukki J & Hurmerinta K. Five-year follow-up of maxillary distraction osteogenesis on the dentofacial structures of children with cleft lip and palate. *J Oral Maxillofac Surg.* 2010; 68: 744-750.

40. Gateno J, Engel ER, Teichgraeber JF, et al. A new Le Fort I internal distraction device in the treatment of severe maxillary hypoplasia. *J Oral Maxillofacial Surg.* 2005; 63: 148-154.
41. Governale LS. Craniosynostosis. *Pediatr Neurol.* 2015; 53: 394-401.
42. Smyth MD, Tenenbaum MJ, Kaufman CB, et al. The “clamshell” craniotomy technique in treating sagittal craniosynostosis in older children. *J Neurosurg.* 2006; 105: 245-251.
43. Sugawara, Hirabayashi S, Sakurai A, et al. Gradual cranial vault expansion for the treatment of craniofacial synostosis: a preliminary report. *Ann Plast Surg.* 1998; 40: 554- 565.
44. Sugawara Y, Uda H, Sarukawa S, et al. Multidirectional cranial distraction osteogenesis for the treatment of craniosynostosis. *Plast Reconstr Surg.* 2010; 126: 1691-1698.
45. Satoh K, Mitsukawa N, Kubota Y, et al. Appropriate indication of fronto-orbital advancement by distraction osteogenesis in syndromic craniosynostosis: Beyond the conventional technique. *J Craniomaxillofac Surg.* 2015; 43: 2079-2084.
46. Boyd SB. Management of obstructive sleep apnea by maxillomandibular advancement. *Oral Maxillofac Surg Clin North Am.* 2009; 21: 447- 457.
47. Costantino PD, Buchbinder D. Mandibular distraction osteogenesis: types, applications, and indications. *J Craniofac Surg* 1996; 7: 404–7.
48. Elsalanty ME, Malavia V, Zakhary I, et al. Dentate transport discs can be used to reconstruct large segmental mandibular defects. *J Oral Maxillofac Surg.* 2015; 73: 745-758.
49. McCormick S Distraction osteogenesis. *Dent Today* 1996; 15: 58.
50. Garcia AG, Martin MS, Vila PG, et al. Minor complications arising in alveolar distraction osteogenesis. *J Oral Maxillofac Surg* 2002; 60: 496–501.
51. Grayson BH, Santiago PE. Treatment planning and biomechanics of distraction osteogenesis from an orthodontic perspective. *Semin Orthod* 1999; 5: 9–24.