

BÖLÜM 1

MAKSİLLANIN VE SUTURLARIN GELİŞİMİNE GENEL BİR BAKIŞ

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GİRİŞ

Kraniyofasiyal büyüme, ortodontik tedavinin prognozunu etkileyen temel belirleyicilerden biridir. İskeletsel kökenli maloklüzyonların düzeltilmesi, fonksiyonel ve ortopedik apareyler aracılığıyla çenelerin büyüme yönü ve boyutlarının modifiye edilmesiyle olanaklı hale gelmektedir. Ortodontide fonksiyonel apareyler yardımıyla uygulanan ortopedik kuvvetler, büyüme gelişimin modifikasyonu ile, maksilla ve/veya mandibulanın; sagittal, vertikal ve transversal düzlemdeki uyumsuzluklarını gidermek amacıyla sıklıkla kullanılmaktadırlar. Maksilla, ortopedik kuvvet uygulamasından etkilenebilecek birçok sutur yoluyla kraniyuma bağlanmaktadır. Bu bölgedeki suturlarda yaş ile önemli değişimler gözlenmekte olup dolayısıyla uygulanan kuvvetlere karşı gelişebilecek direnç bu anatomik yapıların olgunlaşması ile yakından ilişkilidir.

NAZOMAKSİLLER KOMPLEKSİN BÜYÜME & GELİŞMESİ

Nazomaksiller kompleksin prenatal büyüme & gelişimi

Orta yüz veya nazomaksiller yapı, maksiller, nazal, elmacık, lakrimal, palatin kemik gibi çift kemikleri, burun boşluğu içindeki konkalari ve vomeri içermektedir. Doğum öncesi insan fetüslerinde ayrıca sol ve sağ premaksiller kemikler bulunur; ancak bunlar normalde doğumdan sonraki 3-5 yıl içinde üst çeneyle birleşmektedir (Şekil 1).

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SONUÇ

Maksillanın ve suturların gelişimi, ortodontik tedavi planlamasında özellikle büyüme dönemindeki hastalar için büyük öneme sahiptir. Maksiller büyümenin yönü ve süresi, özellikle iskeletsel bozukluklarının erken dönemde tedavi edilebilmesini mümkün kılarken, suturların açıklık durumu da ortopedik apareylerin etkinliğini ve başarısını doğrudan etkiler. Özellikle üst çenenin genişletilmesi ve öne alınması gereken durumlarda, midpalatal sutur ve zigomatikomaksiller sutur açıklıklarının kontrol edilebilmesi, doğru şekilde değerlendirilmesi ve tedavi zamanlamasının belirlenmesinde önemli rol oynamaktadır. Sonuç olarak, bu yapısal gelişimlerin dikkate alınması ve güncel görüntüleme yöntemleri ile incelenmesi hem fonksiyonel hem de estetik açıdan daha kalıcı ve dengeli sonuçlar elde edilmesini olanak sağlamaktadır.

KAYNAKLAR

1. Graber LW, Vig KW, Huang GJ, Fleming PS, 2022. Orthodontics-E-Book: Orthodontics-E-Book, Elsevier Health Sciences, p.
2. Griffin JN, Compagnucci C, Hu D, Fish J, Klein O, Marcucio R, Depew MJ, 2013. Fgf8 dosage determines midfacial integration and polarity within the nasal and optic capsules. *Developmental biology*, 374, 1, 185-97.
3. Scott JH, (1954). The growth of the human face, SAGE Publications.
4. Erverdi N, 2022. Çağdaş Ortodonti, p.
5. Behrents RG, Harris EF, 1991. The premaxillary-maxillary suture and orthodontic mechanotherapy. *American journal of orthodontics and dentofacial orthopedics*, 99, 1, 1-6.
6. Savoldi F, Wong KK, Yeung AW, Tsoi JK, Gu M, Bornstein MM, 2022. Midpalatal suture maturation staging using cone beam computed tomography in patients aged between 9 to 21 years. *Scientific Reports*, 12, 1, 4318.
7. Shayani A, Merino-Gerlach MA, Garay-Carrasco IA, Navarro-Cáceres PE, Sandoval-Vidal HP, 2023. Midpalatal Suture Maturation Stage in 10-to 25-Year-Olds Using Cone-Beam Computed Tomography—A Cross-Sectional Study. *Diagnostics*, 13, 8, 1449.
8. Korbmacher H, Schilling A, Püschel K, Amling M, Kahl-Nieke B, 2007. Age-dependent three-dimensional microcomputed tomography analysis of the human midpalatal suture. *Journal of Orofacial Orthopedics= Fortschritte Der Kieferorthopädie: Organ/official Journal Deutsche Gesellschaft Fur Kieferorthopädie*, 68, 5, 364-76.
9. Jimenez-Valdivia LM, Malpartida-Carrillo V, Rodríguez-Cárdenas YA, Dias-Da Silveira HL, Arriola-Guillén LE, 2019. Midpalatal suture maturation stage assessment in adolescents and young adults using cone-beam computed tomography. *Progress in orthodontics*, 20, 1-7.
10. Melsen B, 1972. A histological study of the influence of sutural morphology and skeletal maturation on rapid palatal expansion in children. *Transactions. European Orthodontic Society*, 499-507.
11. Melsen B, 1975. Palatal growth studied on human autopsy material: a histologic microradiographic study. *American journal of orthodontics*, 68, 1, 42-54.
12. Ülgen M, 2010, Anomaliler, Sefalometri, Etioloji, Büyüme ve Gelişim, Tanı İçinde: Yüz İskeletinin Büyüme ve Gelişimi. Ankara Üniversitesi Diş Hekimliği Yayınları. Yayın, 30,
13. Hesby RM, Marshall SD, Dawson DV, Southard KA, Casko JS, Francis RG, Southard TE, 2006. Transverse skeletal and dentoalveolar changes during growth. *American Journal of Orthodontics and Dentofacial Orthopedics*, 130, 6, 721-31.

14. Lux CJ, Conradt C, Burden D, Komposch G, 2004. Transverse development of the craniofacial skeleton and dentition between 7 and 15 years of age—a longitudinal postero-anterior cephalometric study. *The European Journal of Orthodontics*, 26, 1, 31-42.
15. Bishara SE, Staley RN, 1987. Maxillary expansion: clinical implications. *American journal of orthodontics and dentofacial orthopedics*, 91, 1, 3-14.
16. Netter FH, 2010, *Netter's atlas of human anatomy*, Saunders Elsevier, p.
17. Todd TW, Lyon D, 1925. Cranial suture closure. *Am J Phys Anthropol*, 8, 23-31.
18. Persson M, Magnusson B, Thilander B, 1978. Sutural closure in rabbit and man: a morphological and histochemical study. *Journal of anatomy*, 125, Pt 2, 313.
19. Kokich VG, 1976. Age changes in the human frontozygomatic suture from 20 to 95 years. *American journal of orthodontics*, 69, 4, 411-30,
20. Persson M, 1995. The role of sutures in normal and abnormal craniofacial growth. *Acta Odontologica Scandinavica*, 53, 3, 152-61.
21. Cendekiawan T, Wong RW, Rabie ABM, 2010, Relationships between cranial base synchondroses and craniofacial development: a review. *The Open Anatomy Journal*.
22. Enlow A, (1990). *Facial Growth* WB Saunders Company Philadelphia, USA.
23. Madeline LA, Elster AD, 1995. Suture closure in the human chondrocranium: CT assessment. *Radiology*, 196, 3, 747-56.
24. Tahiri Y, Paliga JT, Vossough A, Bartlett SP, Taylor JA, 2014. The spheno-occipital synchondrosis fuses prematurely in patients with Crouzon syndrome and midface hypoplasia compared with age-and gender-matched controls. *Journal of Oral and Maxillofacial Surgery*, 72, 6, 1173-9.
25. Shirley NR, Jantz RL, 2011. Spheno-occipital synchondrosis fusion in modern Americans. *Journal of forensic sciences*, 56, 3, 580-5.
26. Hayashi I, 2003. Morphological relationship between the cranial base and dentofacial complex obtained by reconstructive computer tomographic images. *The European Journal of Orthodontics*, 25, 4, 385-91.
27. Can IO, Ekizoglu O, Hocaoglu E, Inci E, Sayin I, Kaya KH, 2014. Forensic age estimation by spheno-occipital synchondrosis fusion degree: computed tomography analysis. *Journal of Craniofacial Surgery*, 25, 4, 1212-6.
28. Franklin D, Flavel A, 2014. Brief communication: timing of spheno-occipital closure in modern Western Australians. *American Journal of physical anthropology*, 153, 1, 132-8.
29. Lottering N, MacGregor DM, Alston CL, Gregory LS, 2015. Ontogeny of the spheno-occipital synchondrosis in a modern Q ueensland, A ustralian population using computed tomography. *American journal of physical anthropology*, 157, 1, 42-57.
30. Fernández-Pérez MJ, Alarcón JA, McNamara Jr JA, Velasco-Torres M, Benavides E, Galindo-Moreno P, Catena A, 2016. Spheno-occipital synchondrosis fusion correlates with cervical vertebrae maturation. *PLoS One*, 11, 8, e0161104.
31. Alhazmi A, Vargas E, Palomo JM, Hans M, Latimer B, Simpson S, 2017. Timing and rate of spheno-occipital synchondrosis closure and its relationship to puberty. *PLoS One*, 12, 8, e0183305.
32. Demirturk Kocasarac H, Altan AB, Yerlikaya C, Sinanoglu A, Noujeim M, 2017. Correlation between spheno-occipital synchondrosis, dental age, chronological age and cervical vertebrae maturation in Turkish population: is there a link? *Acta Odontologica Scandinavica*, 75, 2, 79-86.
33. Al-Gumaei WS, Al-Attar R, Al-Tayar B, Al-Hadad SA, Alyafursee ES, Al-Mashraqi AA, Alhasimi N, Zheng Y, Alhammadi MS, 2022. Comparison of spheno-occipital synchondrosis maturation stages with three-dimensional assessment of mandibular growth. *BMC Oral Health*, 22, 1, 654.
34. Baccetti T, Franchi L, McNamara Jr JA, 2000, Treatment and posttreatment craniofacial changes after rapid maxillary expansion and facemask therapy. *American Journal of Orthodontics and Dentofacial Orthopedics*, 118, 4, 404-13.

35. Zhao N, Xu Y, Chen Y, Xu Y, Han X, Wang L, 2008. Effects of Class III magnetic orthopedic forces on the craniofacial sutures of rhesus monkeys. *American journal of orthodontics and dentofacial orthopedics*, 133, 3, 401-9.
36. Cordasco G, Matarese G, Rustico L, Fastuca S, Caprioglio A, Lindauer SJ, Nucera R, 2014. Efficacy of orthopedic treatment with protraction facemask on skeletal Class III malocclusion: a systematic review and meta-analysis. *Orthodontics & Craniofacial Research*, 17, 3, 133-43.
37. Yavuz I, Halicioğlu K, Ceylan I, 2009. Face mask therapy effects in two skeletal maturation groups of female subjects with skeletal Class III malocclusions. *The Angle Orthodontist*, 79, 5, 842-8.
38. Kambara T, 1977. Dentofacial changes produced by extraoral forward force in the *Macaca irus*. *American journal of orthodontics*, 71, 3, 249-77.
39. Yu HS, Baik HS, Sung SJ, Kim KD, Cho YS, 2007. Three-dimensional finite-element analysis of maxillary protraction with and without rapid palatal expansion. *The European Journal of Orthodontics*, 29, 2, 118-25.
40. Angelieri F, Cevidanes LH, Franchi L, Gonçalves JR, Benavides E, McNamara Jr JA, 2013. Midpalatal suture maturation: classification method for individual assessment before rapid maxillary expansion. *American Journal of Orthodontics and Dentofacial Orthopedics*, 144, 5, 759-69.
41. Angelieri F, Franchi L, Cevidanes LH, Hino CT, Nguyen T, McNamara Jr J, 2017. Zygomaticomaxillary suture maturation: A predictor of maxillary protraction? Part I-A classification method. *Orthodontics & craniofacial research*, 20, 2, 85-94.
42. Chou EC, 2020. Maturational Staging of the Midpalatal and Zygomaticomaxillary Sutures: A Morphological Study Using CBCT, University of Pittsburgh.
43. Ok G, Sen Yilmaz B, Aksoy DO, Kucukkeles N, 2021. Maturity evaluation of orthodontically important anatomic structures with computed tomography. *European Journal of Orthodontics*, 43, 1, 8-14.
44. Jahanbin A, Chamani A, Hoseini Zarch H, Hajebi Khaniki S, 2021. Comparative three-dimensional evaluation of spheno-occipital synchondrosis and zygomatico-maxillary suture in cleft lip and palate children versus the normal population. *International Journal of Pediatrics*, 9, 6, 13691-702.
45. Ladewig VDM, Almeida-Pedrin RR, Capelozza-Filho L, Coelho KDSV, Lyra AO, Conti ACD-CF, 2022. Rapid Maxillary Expansion Based on the Correlation of the Maturation Between the Midpalatal and Zygomaticomaxillary Sutures through CBCT. *Iranian Journal of Orthodontics*, 17, 2, 1-9.
46. Angle EH, 1903. Some basic principles in orthodontia. *The International Dental Journal*, 24, 10, 729.
47. Liu S, Xu T, Zou W, 2015. Effects of rapid maxillary expansion on the midpalatal suture: a systematic review. *European journal of orthodontics*, 37, 6, 651-5.
48. Haas AJ, 1961. Rapid expansion of the maxillary dental arch and nasal cavity by opening the midpalatal suture. *The Angle Orthodontist*, 31, 2, 73-90.
49. Persson M, Thilander B, 1977. Palatal suture closure in man from 15 to 35 years of age. *American journal of orthodontics*, 72, 1, 42-52.
50. Jang H-I, Kim S-C, Chae J-M, Kang K-H, Cho J-W, Chang N-Y, Lee K-Y, Cho J-H, 2016. Relationship between maturation indices and morphology of the midpalatal suture obtained using cone-beam computed tomography images. *The korean journal of orthodontics*, 46, 6, 345-55.
51. Coşkun HG, Atik E, Taner T, 2018. Relationship between midpalatal suture maturation and age and maturation of cervical vertebrae: radiographic evaluation. *Acta Odontologica Turcica*, 35, 3, 69-74.
52. Mahdian A, Safi Y, Dalaie K, Kavousinejad S, Behnaz M, 2020. Correlation assessment of cervical vertebrae maturation stage and mid-palatal suture maturation in an Iranian population. *Journal of the World Federation of Orthodontists*, 9, 3, 112-6.