

18-Month Follow-Up: Treatment of Anterior Open Bite in a Skeletal Class II Patient Using the Modified Kim Method

18 Aylık Takip: İskeletsel Sınıf II Hastada Anterior Açık Kapanışın Modifiye Kim Metodu ile Tedavisi

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This case report was presented as an oral presentation at 7th Congress of the Balkan Association of Orthodontic Specialists and the 18th International Turkish Orthodontic Society Symposium, October 27-30, 2023, İstanbul, Türkiye.

ABSTRACT Treating an anterior open bite in adults presents a challenge for orthodontists due to its complex nature and the potential for relapse. This case study outlines the sophisticated orthodontic treatment of an adult's anterior open bite, detailing both the process and the outcomes. The results achieved using the tongue crib and modified Kim method in a female patient with skeletal Class II malocclusion and an anterior open bite are demonstrated. The tongue thrust was eliminated, and modified Kim mechanics were chosen over surgery by the patient's preference. After leveling, the open bite was addressed using 0.016x0.022-inch nickel-titanium wires with an augmented Spee curve in the upper arch and a reverse Spee curve in the lower arch, along with intermaxillary elastics in the anterior region. Ideal overjet and overbite were achieved, resulting in a balanced occlusion. The 18-month follow-up showed a slight relapse; however, the occlusion remains acceptable. The Enacar-modified Kim method provides satisfactory outcomes for adult patients seeking non-surgical treatment. The modified Kim technique serves as an alternative to surgery; however, patients should be monitored for any relapse following treatment.

ÖZET Açık kapanış tedavisi, düzeltilmesinin zorluğu ve nüks potansiyeli göz önünde bulundurulduğunda, ortodontistler için zorlayıcı bir maloklüzyondur. Bu vaka raporu, erişkin bir hastada anterior açık kapanışın ortodontik tedavi sürecini ve sonuçlarını detaylı bir şekilde özetlemektedir. İskeletsel Sınıf II maloklüzyonu ve anterior açık kapanışa sahip bir kadın hastada, dil paravanı ve modifiye Kim metodu ile elde edilen sonuçlar gösterilmektedir. Dil itme alışkanlığı giderilmiş ve hasta tercihi doğrultusunda cerrahi tedavi yerine modifiye Kim mekaniği uygulanmıştır. Seviyeleme işleminden sonra, açık kapanış; üstte artırılmış Spee eğrisi, altta ters Spee eğrisi ve anterior bölgede intermaksiller elastik kullanılarak 0,016x0,022 inç nikel titanyum teller ile tedavi edilmiştir. İdeal overjet ve overbite değerleri elde edilerek dengeli bir oklüzyon sağlanmıştır. On sekiz aylık takip sürecinde hafif bir nüks gözlemlenmiş olmasına rağmen oklüzyon kabul edilebilir seviyede kalmıştır. Enacar ve ark. tarafından geliştirilen Kim yöntemi, ortognatik cerrahiye başvurmayan erişkin hastalar için tatmin edici sonuçlar sağlamaktadır. Modifiye Kim tekniği, cerrahiye bir alternatif olarak sunulmaktadır; ancak hastanın tedavi sonrası olası bir nüks açısından düzenli olarak takip edilmesi gerekmektedir.

Keywords: Open bite; orthodontic appliances, fixed; malocclusion

Anahtar Kelimeler: Açık kapanış; sabit ortodontik apareyler; maloklüzyon

An open bite is a condition in centric occlusion in which there is a lack of vertical contact between the anterior and/or posterior teeth. Understanding the etiological factors of open bite malocclusion is crucial in the management of orthodontic anomalies.¹ The accurate diagnosis, successful treatment, and

long-term stability of open bite malocclusion remain consistent subjects of debate and research.² Dental developmental anomalies, non-nutritive sucking habits, orofacial muscular activities, functional tongue abnormalities, mouth breathing, hypertrophic adenoids, and anatomical deviations of the nasal sep-

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Peer review under responsibility of Türkiye Klinikleri Journal of Dental Sciences.

Received: 05 Jan 2024

Received in revised form: 05 Mar 2024

Accepted: 22 Mar 2024

Available online: 27 Mar 2024

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tum are all etiological factors of open bite malocclusion.^{3,4} A range of treatment modalities has been suggested for the management of anterior open bite malocclusion. In the management of open bite, treatment options include persuasive and motivational methods to alter oral habits positively, both removable and fixed appliances for habit modification and an interdisciplinary approach with an otolaryngologist consultation when confronting oral and dental health pathologies.^{5,6} Functional appliances, including the Frankel IV, Bionator, and posterior bite blocks, constitute significant tools in therapeutic interventions. Approaches such as posterior tooth intrusion and anterior tooth extrusion facilitated by mini-screws have been documented in the literature.⁷ The modified Kim method is described as a potentially effective approach for treating malocclusions. In cases with substantial craniofacial reconstructive needs, the consideration of invasive orthopedic and orthodontic treatments, such as orthognathic surgery, may be necessary.⁸ Denison et al. reported a 42.9% relapse rate in open bite cases treated with LeFort I osteotomy.⁹ In cases of skeletal anterior open bite malocclusion, a combined surgical and orthodontic treatment approach should be contemplated; however, it is imperative to respect the patient's prefer-

ence. The Multiloop Edgewise Archwire appliance has been shown to achieve excellent treatment outcomes and fulfill the proposed objectives; however, the application of this technique demands advanced professional expertise.¹⁰

This study aims to evaluate the treatment effects of the modified Kim method, as developed by Enacar et al., in correcting open bite malocclusions, and to assess the stability of these corrections over an 18-month follow-up period.¹¹

CASE REPORT

A 16-year-old female patient, with a chronological age of 16 years and 3 months and in the Ru phase of skeletal development, exhibited skeletal Class II malocclusion (ANB: 6.3) and anterior open bite. She presented to our clinic concerned about the spacing between her teeth (Figure 1). In centric occlusion, the patient exhibits a right-left Angle Class II molar relationship. An open bite is present, extending from the maxillary first premolars to the anterior region, measuring 7 mm in depth and with an overjet of 4.5 mm. While the maxillary arch exhibits no arch length discrepancy, a surplus of 1.5 mm is observed in the mandible. Additionally, there is a 1.5 mm Bolton excess in the anterior ratio of the maxilla, whereas the



FIGURE 1: Pretreatment record; an anterior open bite related to tongue thrusting and a non-consonant smile.

overall ratio is consistent. The patient exhibits tongue-thrust swallowing as an oral habit. Informed consent was obtained for her treatment.

Initially, the patient underwent swallowing training. However, due to nocturnal tongue protrusion between the teeth, which exacerbated the open bite, the construction of a tongue crib was deemed necessary (Figure 2). After the elimination of the tongue-thrust swallowing habit, the patient opted for treatment with the modified Kim mechanics, as she was not in favor of orthognathic surgery. After leveling was achieved, 0.016x0.022-inch nickel-titanium wires with an augmented Spee curve in the upper arch and a reverse Spee curve in the lower arch were applied. First, inter-maxillary elastics were placed between the canine teeth. Once contact was established between the upper and lower canine teeth, the open bite treatment proceeded with box elastics (150-200 grams) in the anterior region.

The management of the open bite involved the extrusion of both lower and upper incisors coupled with the intrusion of the upper molars. Subsequent to the tongue crib's removal, the patient was subjected to four months of observation. Given the absence of any recurrence, the treatment was deemed complete. Spanning a total of 24 months, the therapy culmi-

nated in the attainment of an optimal overjet-overbite relationship and a harmonious occlusion (Figure 3).

In the strategic formulation of the treatment protocol for this case, the patient's compliance was duly accounted for. The modified Kim technique may serve as a viable alternative to orthognathic surgery for selected cases; however, vigilant post-treatment surveillance is imperative to preemptively address any potential for relapse.

For adult patients who are averse to the prospect of orthognathic surgery and demonstrate favorable compliance, the Kim method, as adapted by Enacar et al., has shown encouraging outcomes. Although the modified Kim technique may serve as a substitute for orthognathic surgery in certain instances, diligent post-treatment observation is critical to detect any possible recurrence. In the present case, an 18-month follow-up was implemented, revealing a minor regression after this interval, as depicted in Figure 4. Nonetheless, the occlusal alignment remains within acceptable limits.¹¹

DISCUSSION

The efficacy of open bite management is paramount in mitigating the risk of relapse. In the case presented,



FIGURE 2: Records during treatment: the open bite has intensified.



FIGURE 3: Posttreatment records show good intercuspatation, overjet, overbite, acceptable anteroposterior relationship.



FIGURE 4: 18-months follow-up, with maintenance of adequate overbite and overjet. The maxillary third molars were extracted.

the approach to treating the open bite was twofold: it aimed at eradicating the etiological factors while concurrently directing attention to the therapeutic interventions themselves. The therapeutic outcome included the extrusion of the maxillary anterior incisors, which effectively resolved the open bite. Such

extrusion of the anterior incisors in this instance also augmented the gingival display. While an increased gingival display may enhance aesthetics in patients with deficient smile lines, it can be deemed unattractive in those with an excessive gingival display, commonly referred to as a “gummy smile.” The efficacy and durability of the outcomes achieved through the modified Kim method are contingent upon the rigorously adhered-to retention phase protocol.¹²⁻¹⁴

Throughout the course of treatment, the predefined goals were met with efficacy. The disharmony among the jaw structures was rectified, the anterior open bite was eliminated, and there was a marked enhancement in the facial aesthetics. Most critically, the patient’s primary concern regarding the dental protrusions was comprehensively addressed. In instances of Class II malocclusion where orthognathic surgery is contraindicated or not desired, camouflage therapy emerges as the preferred modality. This method is efficacious in restoring functional occlusion, elevating facial aesthetics to an optimal standard, and bolstering the patient’s self-esteem.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct con-

nection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: Abdulvahit Erdem, Aybüke Asena Atasever İşler; **Design:** Aybüke Asena Atasever İşler; **Control/Supervision:** Abdulvahit Erdem; **Data Collection and/or Processing:** Aybüke Asena Atasever İşler; **Analysis and/or Interpretation:** Aybüke Asena Atasever İşler; **Literature Review:** Abdulvahit Erdem, Aybüke Asena Atasever İşler; **Writing the Article:** Aybüke Asena Atasever İşler; **Critical Review:** Aybüke Asena Atasever İşler; **References and Fundings:** Aybüke Asena Atasever İşler; **Materials:** Abdulvahit Erdem, Aybüke Asena Atasever İşler.

REFERENCES

1. Lone I.M, Zohud O, Midlej K, Paddenberg E, Krohn S, Kirschnock C, et al. Anterior open bite malocclusion: from clinical treatment strategies towards the dissection of the genetic bases of the disease using human and collaborative cross mice cohorts. *Journal of Personalized Medicine*. 2023;13:1617. <https://doi.org/10.3390/jpm13111617>
2. Dimberg L, Lennartsson B, Arnrup K, Bondemark L. Prevalence and change of malocclusions from primary to early permanent dentition: a longitudinal study. *Angle Orthod*. 2015;85(5):728-34. PMID: 25867255; PMCID: PMC8610411.
3. D'Onofrio L. Oral dysfunction as a cause of malocclusion. *Orthod Craniofac Res*. 2019;22 Suppl 1(Suppl 1):43-8. PMID: 31074141; PMCID: PMC6851783.
4. Grippaudo C, Paolantonio EG, Antonini G, Saule R, La Torre G, Deli R. Association between oral habits, mouth breathing and malocclusion. *Acta Otorhinolaryngol Ital*. 2016;36(5):386-94. PMID: 27958599; PMCID: PMC5225794.
5. Işcan HN, Akkaya S, Koralp E. The effects of the spring-loaded posterior bite-block on the maxillo-facial morphology. *Eur J Orthod*. 1992;14(1):54-60. PMID: 1563475.
6. Fränkel R, Fränkel C. A functional approach to treatment of skeletal open bite. *Am J Orthod*. 1983;84(1):54-68. PMID: 6575617.
7. Gehring D, Freeseaman M, Frazier M, Southard K. Extraction treatment of a Class II, Division 1 malocclusion with anterior open bite with headgear and vertical elastics. *Am J Orthod Dentofacial Orthop*. 1998;113(4):431-6. PMID: 9563359.
8. Kuroda S, Sakai Y, Tamamura N, Deguchi T, Takano-Yamamoto T. Treatment of severe anterior open bite with skeletal anchorage in adults: comparison with orthognathic surgery outcomes. *Am J Orthod Dentofacial Orthop*. 2007;132(5):599-605. PMID: 18005833.
9. Denison TF, Kokich VG, Shapiro PA. Stability of maxillary surgery in openbite versus nonopenbite malocclusions. *Angle Orthod*. 1989;59(1):5-10. PMID: 2923322.
10. Kim YH. Anterior openbite and its treatment with multiloop edgewise archwire. *Angle Orthod*. 1987;57(4):290-321. PMID: 3479033.
11. Enacar A, Ugur T, Toroglu S. A method for correction of open bite. *J Clin Orthod*. 1996;30(1):43-8. PMID: 9063168.
12. Tabancis M, Ratzmann A, Doberschütz P, Krey KF. Multiloop edgewise archwire technique and denture frame analysis: a systematic review. *Head Face Med*. 2020 26;16(1):32. PMID: 33243257; PMCID: PMC7690140.
13. Hoppenreijts TJ, Freihofer HP, Stoelinga PJ, Tuinzing DB. Stabiliteit van de orthodontisch-kaakchirurgische behandeling van de open beet in het front [Stability of orthodontic-maxillofacial surgical treatment of anterior open bite deformities]. *Ned Tijdschr Tandheelkd*. 2001;108(5):173-8. Dutch. PMID: 11400592.
14. Kim YH, Han UK, Lim DD, Serrao ML. Stability of anterior openbite correction with multiloop edgewise archwire therapy: a cephalometric follow-up study. *Am J Orthod Dentofacial Orthop*. 2000;118(1):43-54. PMID: 10893472.