



**TREATMENT OF CLASS II DIVISION 2 MALOCCLUSION WITH A BONE-SUPPORTED KELES SLIDER
 APPLIANCE: A CASE REPORT**
**KEMİK DESTEKLİ KELEŞ SLİDER APAREYİ İLE SINIF II DİVİZYON 2 MALOKLÜZYONUN TEDAVİSİ: VAKA
 RAPORU**

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ABSTRACT

Inadequate maxillary incisor display can have a negative impact on facial aesthetics. Correcting a deep bite is typically a challenging step in orthodontic treatment. Untreated deep bites can lead to increased anterior tooth crowding, flaring of the maxillary teeth, periodontal issues, and temporo mandibular joint disorders; it may also limit lateral and anterior mandibular movements. This study aims to examine the treatment of Class II malocclusion and deep bite in a non-growing female patient. In order to correct the Class II malocclusion and to increase the vertical dimension, molar distalization was performed. Subsequently, the intrusion of the lower and upper incisors and the extrusion of the molar teeth were achieved using accentuated curve wires in the upper jaw and reverse curve of spee wires in the lower jaw, thus successfully treating the deep bite. The patient's final occlusion is a Class I closure, and the overbite and overjet have been completed within the ideal ranges. The patient's smile's aesthetic has improved compared to the initial presentation. Therefore, the correction of bite through the intrusion of maxillary and mandibular incisors, along with the extrusion of the molar teeth, can be considered effectively acceptable in non-growing patients.

ÖZ

Üst kesici dişlerin yetersiz görünümü, yüz estetiği üzerinde olumsuz bir etkiye sahip olabilir. Derin kapanışın düzeltilmesi, ortodontik tedavide genellikle zorlu bir süreçtir. Tedavi edilmeyen derin kapanışlar, maksiller anterior dişlerde çapraşıklıkların artmasına, bu dişlerin anterior hareketine, periodontal sorunlara ve temporomandibular eklem bozukluklarına yol açabilir; ayrıca mandibulanın lateral ve anterior hareketlerini sınırlayabilir. Bu çalışmanın amacı, yetişkin bir kadın hastada Sınıf II maloklüzyon ve derin kapanış tedavisini incelemektir. Sınıf II maloklüzyonun tedavisi ve dikey boyutu artırmak amacıyla molar distalizasyonu yapılmıştır. Seviyeleme aşamasından sonra, üst çenede artırılmış spee'li NiTi teller ve alt çenede reverse NiTi teller kullanılarak alt ve üst kesici dişlerin intrüzyonu ve molar dişlerin ekstrüzyonu sağlanmış, böylece derin kapanış başarılı bir şekilde tedavi edilmiştir. Hastanın final oklüzyonu, Sınıf I kapanışı olarak elde edilmiş ve overbite ile overjet ideal aralıklar içinde tamamlanmıştır. Hastanın gülüş estetiği, başlangıç durumuna kıyasla iyileştirilmiştir. Sonuç olarak, yetişkin hastalarda derin kapanışın tedavisinin, maksiller ve mandibular kesici dişlerin intrüzyonu ile etkili bir şekilde tamamlanabildiği görülmektedir.

Keywords: Class II treatment, deep bite, distalization.

Anahtar kelimeler: Sınıf II tedavisi, derin kapanış, distalizasyon.

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INTRODUCTION

An overbite can be described as the condition where the anterior incisor teeth of the upper jaw vertically overlap the incisor teeth of the lower jaw on the vertical axis.¹ According to the Angle classification, the ideal amount of overbite in individuals with normal occlusion is one-third of the crown length of the maxillary incisor teeth.² There are various discrepancies among authors regarding the degree of over bite necessary for the diagnosis of a deep bite.³⁻⁵ According to the Angle classification, if an individual's lower jaw is positioned posteriorly, with the upper incisor teeth in a reclined position and deeply covered, this condition is evaluated as a Class II Division 2 malocclusion.² Nanda defines increased overbite as the condition where the incisor teeth overlap between 25-40 percent, and an overlap exceeding 40 percent is classified as severe (deep) overbite.^{6,7} There is evidence that the aetiology of deep bite occlusion is influenced by genetic, developmental, anatomical, and soft tissue-related factors, as well as factors associated with the upper incisor teeth.⁸ Research indicates that this anomaly demonstrates hereditary transmission.⁹ Furthermore, some researchers have stated that excessive vertical development of the maxilla plays a significant role in the development of Class II Division 2 malocclusion.¹⁰ Various methods can be used for deep bite occlusion treatment. Some of these methods include correction of the bite using an anterior bite plate; the intrusion of the incisor teeth using mini-screws;¹¹ the intrusion of the maxillary incisor teeth and extrusion of the molar teeth using a J hook headgear;¹² the use of Utility archwires in Rickett's bio-progressive treatment approach;¹³ and the preference for rever securve of Spee (RCS) archwires in the upper and lower jaw.¹⁴ These techniques are among the most frequently utilized and successful methods in dental and orthodontic practice.

There are a widerange of treatment options available for dental Class II cases.¹⁵ Thetreatment methods, which vary depending on age, encompass functional appliances that promote jaw development such as activators or twin blocks,¹⁶ the Keles Slider,¹⁷ or molar distalization with in frazy gomatic screws, and fixed functional appliances like the Herbst appliance, Jasper Jumper, or the Forsus.¹⁸ For the adult Class II patient group, orthognathic surgery can be considered a viable treatment alternative.

The Keles Slider is a highly efficient appliance commonly used for the distalization of maxillary molar teeth. It is known to be suitable for use particularly in patients who exhibit dental Class II malocclusion characteristics despite having a Class I skeletal structure, with minimal or no crowding in the mandibular region. In patients over the age of 15, the status of the wisdom teeth should be assessed before the fabrication of this appliance, and if necessary, they should be removed through surgical intervention.¹⁷

Although there are numerous treatment options available for Class II malocclusions, as mentioned above, no case report in the literature has been identified that combines the use of Keles Slider and RCS archwires. This case report aims to address this gap in the literature and provide guidance to clinicians in the management of similar cases.

This case demonstrates the successful correction of a

Class II malocclusion and deep bite in a non-growing patient using molar distalization, incisor intrusion, and molar extrusion. These techniques are not widely documented in the treatment of non-growing patients, making this case a valuable contribution to the literature. It highlights an effective approach to achieving functional and aesthetic outcomes in challenging clinical scenarios.

CASE REPORT

A female patient, who was 15 years and 4 months of age, visited our clinic for orthodontic treatment due to complaints of deep bite. The patient's overall health condition and dental examinations did not reveal any issues that would prohibit orthodontic treatment. Regarding oral habits, nail-biting and lower lip-biting were observed. During the intraoral examination (Figure 1),

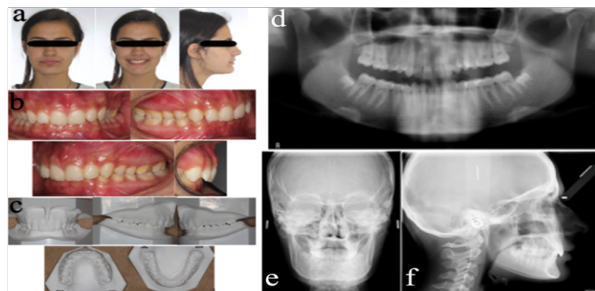


Figure 1. Pretreatment records include (a) extraoral, and (b) intraoral photographs; (c) orthodontic models; (d) panoramic, (e) postero-anterior, and (f) lateral cephalometric radiographs.

the patient was determined to have an Angle Class II malocclusion with an overjet of 4 mm and an overbite of 7 mm. The Hayce Nance model analysis indicated a 2 mm space deficiency in the upper jaw and a 0.5 mm space deficiency in the lower jaw. According to the Bolton analysis, there was a total excess of 2 mm in the lower jaw and 1.5 mm in the anterior region. Radiographic examination revealed that the upper third molar teeth were congenitally absent. However, the lower third molar teeth were radiologically observed.

The cephalometric measurements (Table 1) indicated a skeletal Class I relationship (SNA: 80.7°, SNB: 77.2°, ANB: +3.5°), reduced vertical dimensions (FMA: 17.6°), and the inclination of the upper incisor teeth (U1-SN: 89.5°) positioned reclined relative to the cranial base.

In order to achieve a desirable overbite, overjet, and Class I molar relationship, orthognathic surgery was recommended following fixed appliance treatment. However, as the patient was not receptive to the surgical method, alternative treatment plans were developed.

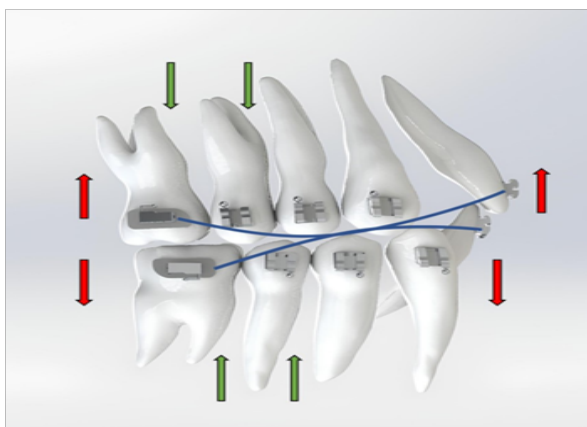
In the treatment of this case, use of the bone supported Keles Slider (Figure 2) for molar distalization and fixed mechanics to increase the vertical dimension was aimed, in addition to achieving the ideal overbite, overjet, and molar relationship. The treatment began with the use of a palatal mini screw to support the internal molar distalization. After the distalization procedure, in the third month, 0.018 Roth metal brackets were placed on both the lower and upper teeth. After six months, a transition was made to 0.016 x 0.022 in chstain less steel archwires in both jaws.

Table 1. Lateral cephalometric analysis at pretreatment and posttreatment.

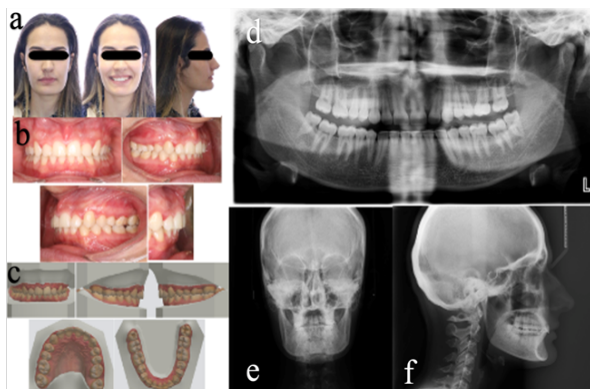
Measurement	Normal	Pretreatment	Posttreatment
SNA ($^{\circ}$)	82.5 ± 3.2	80.7	80.7
SNB ($^{\circ}$)	80.4 ± 3.1	77.2	78.0
ANB ($^{\circ}$)	2.1 ± 1.8	3.5	2.7
WitsAppraisal (mm)	-2.2 ± 2.5	1.7	1.2
FMA (MP-FH) ($^{\circ}$)	23.9 ± 4.1	17.6	19.9
MP- SN ($^{\circ}$)	33.0 ± 5.3	28.0	29.2
Y-Axis (SGn-SN) ($^{\circ}$)	67.0 ± 4.4	65.8	66.1
U1- SN ($^{\circ}$)	108.7 ± 5.7	89.5	101.2
IMPA (L1-MP) ($^{\circ}$)	96.6 ± 6.6	93.6	95.4
InterincisalAngle (U1-L1) ($^{\circ}$)	126 ± 7.0	148.8	132.4
Pog- NB (mm)	2.4 ± 1.0	5.4	5.3
UpperLipto E-Plane (mm)	-0.7 ± 2.2	-5.8	-3.4
LowerLipto E-Plane (mm)	0.5 ± 2.3	-3.5	-2.5

**Figure 2.** Bone-supported Keles slider appliance.¹⁹

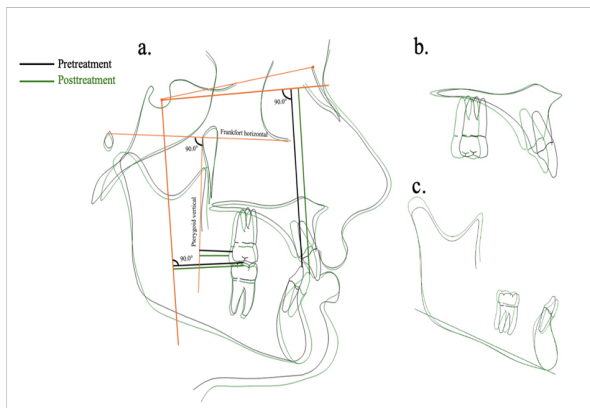
The Keles Slider was removed 10 months, it effectively controlled the anchoring, resulting in the molar teeth reaching Class I position. After the canine and molar teeth were positioned in Class I, the space between the upper canine and lateral teeth was closed by retracting the upper incisor teeth. After leveling the teeth, a slight reduction in the over bite was observed. However, to further improve the appearance of the front teeth, accentuated curve 0.016 x 0.022 inch Ni-Ti archwires in the upper jaw and RCS in the lower jaw were used to align the teeth properly. The effects of the inclined wires on the anterior and posterior teeth are depicted in Figure 3.

**Figure 3.** In the upper and lower dental arches, the curvature will induce the extrusion of premolars, along with the intrusion of molars and incisors in both arches.

The post-treatment lateral cephalometric measurements demonstrated a significant approach to ideal values (Figure 4). Upon analysis of the vertical

**Figure 4.** Posttreatment records include (a) extraoral, and (b) intraoral photographs; (c) orthodontic models; (d) panoramic, (e) postero-anterior, and (f) lateral cephalometric radiographs.

dimensions, an increase was observed compared to the pre-treatment period (FMA: 19.9) (Figure 5). Furthermore, the reduction of the interincisal angle resulted in more ideal incisor inclinations. As a result, an occlusion was achieved with a dental Class I relationship and ideal overbite and overjet after 15 months of orthodontic treatment, with the overall active treatment lasting 25 months.

**Figure 5.** (a) Total superposition relative to the Sella-Nasion plane, (b) maxillary superimposition with respect to the palatal plane, and (c) mandibular superimposition with respect to the mandibular plane (reference points adapted from).²⁰

DISCUSSION

Deep bite is a prominent anomaly in the vertical dimension of the incisor region.²¹ The treatment of this anomaly typically involves the extrusion of posterior teeth, the intrusion of incisor teeth, or a combination of both.^{22,23} In severe cases, orthognathic surgery may also be considered.

There are numerous other factors to consider when planning treatment for such cases. Among these factors, the position of the maxillary incisor teeth during rest and while smiling holds particular importance.

In this instance, the treatment plan consisted of molar distalization using the Keles Slider, along with the use of increased curve 0.016 x 0.022 inch Ni-Ti archwires in the upper jaw, and RCS archwires in the lower jaw after leveling with fixed mechanics, aiming for molar extrusion and incisor intrusion. The decision to utilize the Keles Slider mechanism was primarily driven by the objective of achieving a Class I occlusion and enhancing the vertical dimension, particularly in light of the patient's preference to avoid surgical interventions. The appliance effectively aids in deep bite correction through the incorporation of an anterior bite plane integrated with the Nance button. Following the completion of molar distalization, it has been suggested in the literature,²⁴ that the appliance should remain in place for an additional two months to function as a Nance appliance, ensuring stability and maintaining the achieved distalization.

The pronounced structure of the chin in this case suggests that additional genioplasty may be required following the planned orthognathic surgery. The distalization mechanics, typically used to correct malocclusions resulting from the mesialization of maxillary molars, were employed in this case primarily to enhance vertical dimensions (with an increase of 2.3° in FMA, 1.2° in MP-SN, and 0.3° in the Y-axis angle) and achieve an ideal Angle classification. For this patient, who opted to avoid orthognathic surgery, this treatment approach proved to be both effective and beneficial. The spaces created between maxillary teeth as a result of the distalization movement were successfully managed by rendering the Keles Slider appliance passive and using it as a Nance appliance. This approach effectively prevented anchorage loss and controlled mesial movement of the teeth, demonstrating its practicality and efficacy.

RCS archwires were chosen over utility archwires for their efficiency in minimizing chair side time while also reducing the risk of intraoral irritation and maintaining better oral hygiene. In this case, their use effectively flattened the deep Curve of Spee and achieved the intrusion of the lower incisors. In the literature,²⁴ to evaluate the dental effects of RCS archwires, vertical changes in the lower incisors were assessed by drawing perpendicular lines from the tip of the lower incisor to a vertical reference line before and after treatment. The linear distance between these perpendicular lines was measured to analyze the vertical changes. The result obtained reveals that the mechanical system used functions appropriately for its intended purpose.

In the literature,²⁵ the reduction in the ANB angle highlights the comprehensive effects of RCS archwires on both the dental and skeletal components of

malocclusion, indicating favorable skeletal changes. Although the ANB angle falls within the ideal range, the positive effect of RCS archwires on this parameter has yielded a favorable outcome for our patient with a Class II pattern.

CONCLUSION

This case report proposes an effective and satisfactory treatment method for Class II patients with deep bite issues who are nearing the completion of their growth and development. While extrusion of posterior teeth is commonly considered a favorable treatment option for deep bite cases with reduced vertical dimensions, this report demonstrates that intrusion of anterior teeth can also yield successful outcomes. Additionally, the distalization procedure applied in this case has been observed to produce favorable effects on vertical parameters.

Ethics Committee Approval: Since this study is a case report, ethics committee approval was not obtained.

Informed Consent: Written and verbal consent was obtained from the treated patient.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept-AAAİ; Design-AAAİ; Supervision-NBD; Resources-AAAİ; Materials-AAAİ; Data Collection and/or Processing-NBD; Analysis and/or Interpretation-AAAİ; Literature Search-AAAİ; Writing Manuscript-AAAİ; Critical Review-NBD.

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Hakem Değerlendirmesi: Dış bağımsız.

Yazar Katkıları: Fikir-AAAİ, NBD; Tasarım-AAAİ; Denetleme-NBD; Kaynaklar-AAAİ; Malzemeler-AAAİ; Veri Toplanması ve/veya işlenmesi-NBD; Analiz ve/veya yorum-AAAİ; Literatür taraması-AAAİ; Yazıyı yazan-AAAİ; Eleştirel inceleme-NBD.

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