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Review

Are Miniscrews The Definitive Solution For Solving Dental Class II Problems?

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Abstract

This mini review examines the role of orthodontic miniscrews in the management of dental Class II malocclusions, particularly in cases requiring maxillary molar distalization. Traditional extraoral and intraoral appliances, while effective, often suffer from anchorage loss and depend heavily on patient compliance, leading to compromised outcomes. Miniscrews, by contrast, provide immediate cortical anchorage without the need for osseointegration and can be placed under local anesthesia with minimal discomfort. Their versatility allows use as both direct and indirect anchorage units, enabling predictable distalization of 3–4 mm within 4–6 months. Clinical studies consistently demonstrate superior anchorage control, reduced treatment duration, and minimized adverse effects such as incisor proclination or molar tipping. Despite a reported failure rate of approximately 16%, miniscrews remain a reliable adjunct in orthodontic biomechanics. Recent innovations, including integration with clear aligners and novel appliance designs, further enhance their efficacy and patient-centered outcomes. The reduction in reliance on patient cooperation and the ability to maintain anchorage integrity position miniscrews as a transformative tool in Class II correction. Future research should focus on optimizing design, placement protocols, and digital integration to maximize clinical efficiency and long-term stability.

Mini Vidalar Dişsel Sınıf II Problemlerin Tedavisinde Kesin Çözüm müdür?

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Anahtar Kelimeler
Minividalar
Sınıf II problemler
Hasta işbirliği
Ortodontik tedavi
Ankraj kaybı

Öz

Bu mini derleme, dental Sınıf II maloklüzyonların tedavisinde ortodontik miniscrew'lerin rolünü, özellikle maksiller molar distalizasyon gerektiren olgularda incelemektedir. Geleneksel ekstraoral ve intraoral apareyler etkili olmakla birlikte, sıklıkla ankraj kaybı ve hasta kooperasyonuna bağımlılık nedeniyle tedavi sonuçlarını olumsuz etkileyebilmektedir. Miniscrew'ler ise osseointegrasyona ihtiyaç duymadan, lokal anestezi altında kolaylıkla yerleştirilebilmekte ve anında kortikal ankraj sağlamaktadır. Hem direkt hem de indirekt ankraj ünitesi olarak kullanılabilmeleri sayesinde 4–6 ay içinde 3–4 mm distalizasyon öngörülebilir şekilde elde edilebilmektedir. Klinik çalışmalar, miniscrew kullanımının üstün ankraj kontrolü sağladığını, tedavi süresini kısalttığını ve kesici dişlerde protrüzyon veya molar devrilmesi gibi istenmeyen etkileri azalttığını göstermektedir. Yaklaşık %16 oranında bildirilen başarısızlık oranına rağmen, miniscrew'ler ortodontik biyomekanikte güvenilir bir yardımcı olarak öne çıkmaktadır. Clear aligner sistemleriyle entegrasyon ve yenilikçi aparey tasarımları, etkinliği ve hasta memnuniyetini daha da artırmaktadır. Hasta kooperasyonuna olan bağımlılığın azalması ve ankraj bütünlüğünün korunması, miniscrew'leri Sınıf II düzeltiminde dönüştürücü bir araç haline getirmektedir. Gelecekteki araştırmaların, tasarım optimizasyonu, yerleştirme protokolleri ve dijital sistemlerle entegrasyon üzerine yoğunlaşması, klinik verimliliği ve uzun dönem stabiliteyi daha da geliştirecektir.

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Introduction

Non-extraction orthodontic treatments of dental Class II malocclusions usually require distalization of upper molars. Nowadays, conventional extraoral appliances almost never used for upper molar distalization or increasing maxillary molar anchorage because of encountered cooperation problems during the treatment. When it comes from past to present it is seen that a number of intraoral upper molar distalization appliances that derogate the need for patient cooperation have been used (1). The most known intraoral molar distalization appliances are pendulum-pendex (2), push-coils (3), magnets (4), superelastic NiTi wires (5), distal jet (6), molar slider (7) etc. Even if these appliances effectively distalize the maxillary molars, anchorage loss is ineluctable, it means raising of maxillary incisor protrusion, increased overjet, decreased overbite and also excessive distal tipping of the upper first molars (8).

Miniscrews as a Solution for Class II Malocclusions

Miniscrews are small, easily placed implants that provide reliable anchorage for molar distalization. Unlike traditional appliances, miniscrews do not require patient compliance during treatment, which is a significant advantage in orthodontics. Research has shown that miniscrews provide immediate cortical anchorage and can be placed under local anesthesia with minimal post-operative discomfort (9).

Characteristics of miniscrews

Miniscrews are very easy to place just under local anesthesia.

After the placement, usually a pain or inflammation is not observed.

They are located in bone to offer immediate cortical anchorage and they don't need the osseointegration.

400-500 grams of force can be loaded on it. When it is desired they can be easily removed without anesthesia.

The ideal dimensions of the miniscrews are 8-10 mm length and 1.5 mm diameter to provide the necessary support during the distalization of upper molars.

These can be placed buccally or palatally directly onto the bone (10). Furthermore, miniscrews can be easily removed without anesthesia after the desired tooth movement is achieved.

Using as direct anchorage of miniscrews

For distalization of the upper first molar, 030" diameter heavy NiTi coil spring can be actively placed between miniscrews and the first molar on .019 x .025"ss wire (11) (Figure 1a).

Using as indirect anchorage of miniscrews

Via the full archwire the supporting premolar tooth can be tied to the miniscrew with ligature wire or elastic chain to prevent any mesial movement while the molars are distalized (11) (Figure 1b).

Figure 1a: Using the miniscrews as direct anchorage. **Figure 1b:** Using the miniscrews as indirect anchorage.

Duration and amount of the distalization

Typically, 3-4 mm of upper molar distalization can be achieved in 4 to 6 months with proper force application and regular adjustment of the coil spring. Follow-up appointments every 4 weeks are essential to monitor progress and activate the coil spring as necessary (8).

Acting as an anchorage unit

Once the upper first molars have been distalized into an overcorrected Class I relationship, the system can be converted into a Nance anchoring unit. This provides additional stability and support during the retention phase of treatment. (1) (Figure 2).

Figure 2: Modified nance anchoring unit.

Failure rate of miniscrews

A systematic review of the literature showed that there is 16.4% failure rate for miniscrews (12). This ratio seems to be very small and expresses that miniscrews gives enough support for needed tooth movements.

Discussion

Miniscrews have become an essential tool in modern orthodontics for managing Class II malocclusions. One of the primary advantages of miniscrews is their ability to provide stable anchorage without requiring patient compliance. This characteristic significantly reduces treatment complexity and increases the predictability of molar distalization. Research consistently supports the use of miniscrews for upper molar distalization, demonstrating that they offer superior anchorage control compared to traditional appliances.

Biomechanical considerations and anchorage control

A 2024 finite element analysis study compared the biomechanical characteristics of maxillary molar distalization using clear aligners in conjunction with three types of miniscrew anchorage: direct buccal, direct palatal, and indirect buccal. The findings indicated that direct palatal miniscrew anchorage resulted in the greatest molar distalization, reduced mesial movement of premolars, and minimized labial tipping of anterior teeth, thereby enhancing overall treatment efficacy (13).

Furthermore, a 2025 study assessed the dentoskeletal effects of Class II elastics versus infrazygomatic crest (IZC) miniscrew anchorage during maxillary molar distalization with clear aligners. The results demonstrated that miniscrew anchorage led to more distal movement of the upper second molars and was preferable when overbite reduction was desired without inducing lower incisor proclination (14).

Clinical efficacy and treatment duration

A 2025 retrospective cohort study compared the total treatment duration between hybrid pendulum and buccal interradicular miniscrew-supported maxillary molar distalization mechanics followed by fixed appliances. The study found that the use of buccal interradicular miniscrew-supported mechanics resulted in a shorter overall treatment duration, highlighting the efficiency of miniscrew-assisted distalization in clinical practice (15).

Innovations in distalization appliances

Innovative appliances have been developed to enhance the effectiveness of molar distalization. A study introduced a novel molar distalization appliance combining a palatal sagittal screw and a miniscrew placed in the anterior paramedian region. This design aimed to deliver a distalizing force to the upper molars for bodily distal movement, offering a promising alternative for Class II correction (11).

Patient-centered outcomes and compliance

Patient compliance remains a critical factor in the success of orthodontic treatments. The incorporation of miniscrews reduces the reliance on patient cooperation, thereby minimizing the risk of anchorage loss and enhancing treatment predictability. Studies have reported high patient satisfaction with miniscrew-assisted treatments due to reduced discomfort and the elimination of the need for extraoral appliances.

Future directions

Ongoing research is focused on optimizing miniscrew design, placement techniques, and integration with digital orthodontic systems (Figure 3). The development of patient-specific treatment plans using advanced imaging and simulation technologies holds promise for further improving the precision and outcomes of miniscrew-assisted maxillary molar distalization.

Figure 3: In a case, correction of the Class II dental malocclusion.

Declarations

Ethics Committee Permission Statement

Ethics committee approval was not required for this study, as no human or animal subjects were involved. The ethical principles of scientific research and publication were followed throughout the study.

Conflict of Interest Statement

The author declares no conflict of interest.

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Authors Contribution Statement

İbrahim Erhan Gelgör: The author contributed to conceptualisation, methodology, data analysis, writing, review, and editing of the manuscript.

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