

DIRECT USAGE OF MINISCREW ANCHORAGE TO INTRUDE OVERERUPTED MAXILLARY POSTERIOR TEETH BEFORE PROSTHODONTIC PREPARATION: A CASE REPORT

Erken Dönemda Kaybedilmiş Alt Posterior Dişlerin Protetik Restorasyonu Öncesinde Fazla Uzamış Üst Posterior Dişlerin Minivida Ankraji ile Gömülmesi: Olgu Bildirisi

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ABSTRACT

Overeruption of maxillary molars due loss of opposing teeth creates occlusal and functional interferences. Before reconstruction can be initiated, intrusion of overerupted molars becomes essential. This report illustrates treatment of overerupted maxillary premolar and molar via direct use of miniscrew anchorage. A 24-year old female had lost first and second left mandibular molars due to pulpal necrotizing agents, resulting with a large alveolar bone defect and overerupted maxillary premolar and molar. She had a history of unsuccessful alveolar distraction of mandibular left premolars to increase the alveolar bone height prior to implant placement. Patient was satisfied with her smile and refused comprehensive orthodontic treatment. Maxillary premolar and molar were intruded segmentally for 4mm in 8 months, using a combination of a mini-implant and partial-fixed edgewise appliances. Biological responses of teeth and surrounding bony structures to intrusion appeared normal and acceptable in radiographic and clinical examination.

ÖZ

Alt dişlerin kaybına bağlı olarak üst dişlerin aşırı uzaması, oklüzal ve fonksiyonel erken temaslara neden olmaktadır. Kaybedilen dişlerin protetik olarak geri kazandırılabilmesi için çoğunlukla öncelikle karşıt arktaki dişlerin ortodontik olarak gömülmesi gerekmektedir. Bu rapor, aşırı uzamış üst premolar ve molar dişlerin doğrudan ortodontik minividalardan ankraj alınarak gömüldüğü bir vakayı bildirmektedir. 24 yaşındaki bayan hasta pulpal nekrotizan ajanların kaviteden sızması sonucu sol alt birinci ve ikinci azı dişlerini kaybetmişti. Buna bağlı olarak alt çenede büyük bir alveoler kemik defekti ve üst arktaki dişlerde uzama meydana gelmişti. Hastanın hikayesinde restorasyon öncesinde defekt bölgesinde alveolar kemik yüksekliğini artırabilmek amacıyla alveolar distraksiyon uygulandığı ancak transport segmentteki premolar dişlerin devitalize olması ile bu tedavinin başarısız olduğu öğrenildi. Hasta gülüş estetiğinden memnundu ve kapsamlı bir ortodontik tedaviyi reddetti. Segmental ortodontik mekanikler ve minivida yardımı ile üst sol premolar ve molar dişler 8 ayda 4mm gömülmesini takiben alt dişler protetik olarak restore edildi. Radyografik ve klinik muayenede dişlerin ve çevre dokuların intruziyona verdiği biyolojik cevabın normal ve kabul edilebilir olduğu görüldü.

Keywords: Miniscrew; interdisciplinary treatment; orthodontic intrusion; direct anchorage

Anahtar kelimeler: Minivida; disiplinler arası tedavi; ortodontik gömme; doğrudan ankraj

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Introduction

Case Presentation

A 24-year old female patient was seeking restoration of her left mandibular posterior edentulous area and was referred to our clinic by the prosthodontics department. She had overerupted maxillary left second premolar and first molar teeth due to the loss of lower left molars (Figure 1).

At the age of 18, the patient consulted a dentist for the pain in her lower left first molar tooth. After application of pulpal necrotizing agent into the dental cavity, the patient returned to the dentist months later despite doctor's instructions to return 2 days later. In the meantime, the necrotizing agent leaked from the dental cavity and damaged the neighboring periodontium and second molar teeth. Eventually the patient lost first and second left mandibular molars, resulting with a large alveolar bone defect (Figure 2a).



Figure 1. Pretreatment facial and intraoral photographs.

She was presented a treatment plan that consisted of alveolar distraction of left premolars posteriorly until third molar to increase the alveolar bone height prior to implant placement, orthodontic intrusion of overerupted upper teeth and finally prosthetic implant replacement of the missing teeth (Figure 2b, 2c). However, distraction protocol was unsuccessful and the premolar teeth lost vitality. After endodontic treatment of premolars, the patient was referred to department of orthodontics.

Diagnosis and Etiology

This patient presented with a skeletal Class II relationship due to retrognathic mandible and she had a slightly convex profile (Figure 3). Her dental condition revealed Class II canine and molar relationships, retroclined maxillary incisors and proclined mandibular incisors, normal overjet and overbite, mild maxillary crowding, overerupted maxillary

left second premolar and first molar and missing lower left first and second molar teeth. Judging by the marginal ridge of maxillary left first premolar on the dental casts, it was measured that maxillary left

second premolar and first molar have overerupted by 4 mm, disturbing the occlusal plane continuity and resulting in inadequate occlusal clearance for esthetic and functional mandibular restorations.

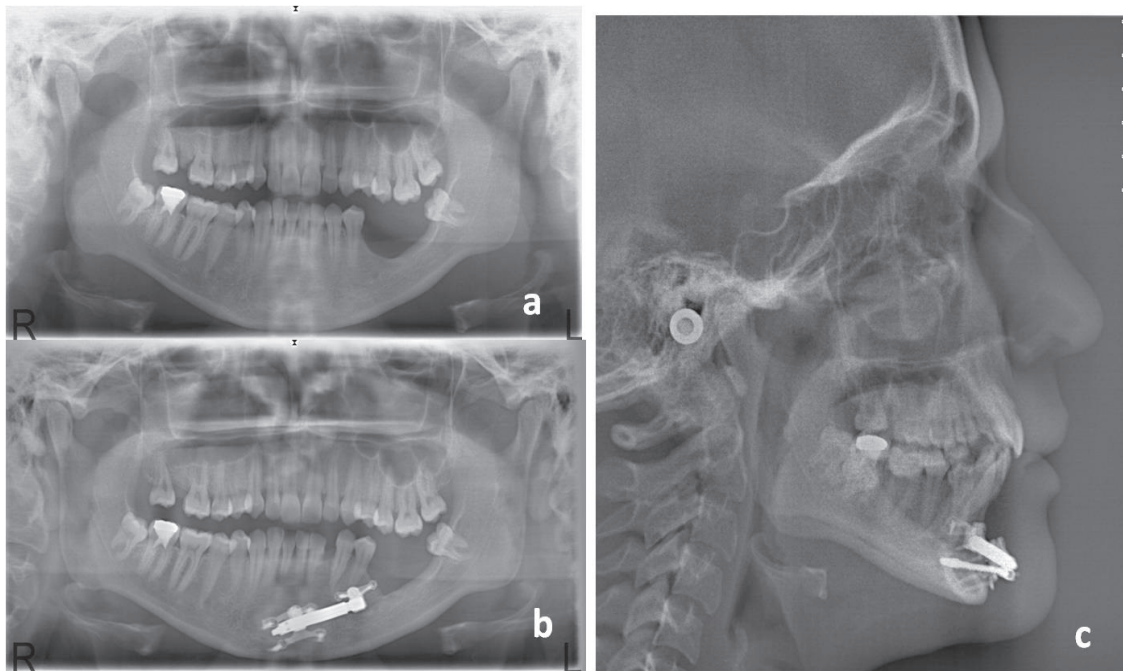


Figure 2. a) Pretreatment panoramic radiograph, b) Panoramic radiograph with alveolar distractor, c) Lateral cephalometric radiograph showing alveolar distractor.



Figure 3. Pretreatment cephalometric radiograph.

of overerupted teeth and distalization of posterior dentition in the maxillary arch and leveling and alignment in the mandibular arch. Treatment objectives were to correct posterior interdigitation, resolve anterior crowding, provide enough clearance for lower posterior restorations and improve smile esthetics. Patient was satisfied with her smile and occlusion.

Her main concern was reconstruction of lower edentulous area and she wanted to solve her dental problems as soon as possible. Therefore, she refused comprehensive orthodontic treatment. An alternative treatment plan that focused on intrusion of maxillary left premolar and molar with segmental mechanics and direct miniscrew anchorage was proposed. This plan was adopted by the patient for esthetics and shorter treatment duration.

Treatment Objectives

We presented a treatment plan that included comprehensive orthodontic treatment with intrusion

Progress

Pretreatment orthodontic records (intraoral and extraoral photographs, maxillary and mandibular

dental casts, lateral cephalometric and panoramic radiographs) were collected. After separation, an alginate impression with molar bands on maxillary first molars was taken. A transpalatal arch (TPA) with acrylic button was constructed and soldered to molar bands. This was then bonded with a dual-cure glass ionomer cement to bilateral molar teeth. A partial-fixed 0.018-inch slot edgewise appliance was placed on the upper left second premolar and first molar, levelled sequentially with 0.016-in and 0.016x0.022-in segmental nickel-titanium archwires (Figure 4a). After leveling and alignment, 0.016x0.022-in stainless-steel segmental archwire was placed. At the same session, a non-osteointegrated miniscrew (length, 7mm; diameter, 1.6 mm; Turkuaz, Medikodental, Turkey) was placed through the keratinized gingiva into the buccal alveolar bone between the roots of second premolar and first molar

under infiltrative local anesthesia. Miniscrew was inserted high on the attached gingiva, slightly below the mucogingival junction; taking into consideration the amount of intrusion. Care was taken to apply the anesthesia deep into the sulcus in order not to cause swollen mucosa, which can be deceiving about the height of mucogingival junction. A light intrusive force of (100-150 gr) was loaded immediately by power-chains between the archwire and the miniscrew (Figure 4b). After intrusion was completed, miniscrew and appliances were retained in place to prevent re-eruption until the prosthesis were installed (Figure 5a). After cementation of lower restorations, the miniscrew and other appliances were removed without the need for local anesthesia (Figure 5b). No retainer was required because the posterior vertical dimension had been reconstructed. The patient's occlusion now became stable and functional.



Figure 4. a) Levelling with segmental 0.016-in nickel-titanium archwire b) power-chains between 0.016x0.022-in stainless-steel archwire and miniscrew.

Results

Maxillary premolar and molar teeth were intruded segmentally by using a combination of a mini-implants and partial-fixed edgewise appliances without disturbing the occlusion and the other dentition in a short period. Total orthodontic treatment time was 8 months. Pretreatment and post treatment records were compared to evaluate treatment results.

In order to measure the amount of intrusion; firstly a vertical line that passes from the intermaxillary suture was drawn (Line A). Vertical lines (Line B and C) that extends downwards from the buccal cusp tip of 2nd premolar (Point 1) and mesiobuccal cusp tip of 1st molar

(Point 2) to was drawn parallel to Line A. The points where Lines B and C intersect the superior border of the mandibular corpus were marked (Point 3 and 4). Distances between points 1-3 and 2-4 were measured in pretreatment and posttreatment OPTGs. (Figure 6) The increase in the posttreatment OPTG was recorded as the amount of intrusion.

In pretreatment OPTG, the maxillary sinus floor showed pneumatization due to over-eruption of the teeth. Post treatment panoramic radiograph and clinical examination showed that roots of the intruded teeth remained intact (Figure 6). Bicuspid was intruded

effectively without tipping but some mesial tipping of the molar tooth was seen despite the segmental 0.016x0.022-in stainless-steel archwire. Tipping of the molar can be a

result of the larger root mass of the tooth and therefore the higher cortical resistance of the sinus floor, repressing parallel intrusion of the tooth.



Figure 5. a) Appliances retained in place until final restoration of lower teeth b) Immediately after removal of miniscrew and appliances c) Post-treatment facial photographs.

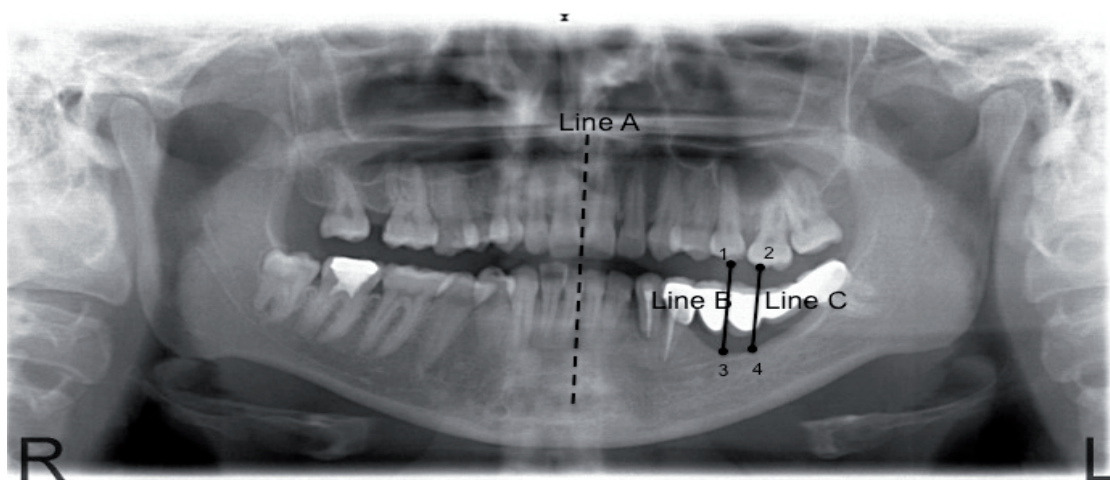


Figure 6. Diagram explaining the method of measurements on post treatment panoramic radiograph.

Figure 7 shows the pre and post-treatment cast models of the patient. The line that connects the mesial cusp tip of upper second molar and the cuspid

emphasize the change in the level of marginal gingiva and the change in the occlusal level of intruded teeth.

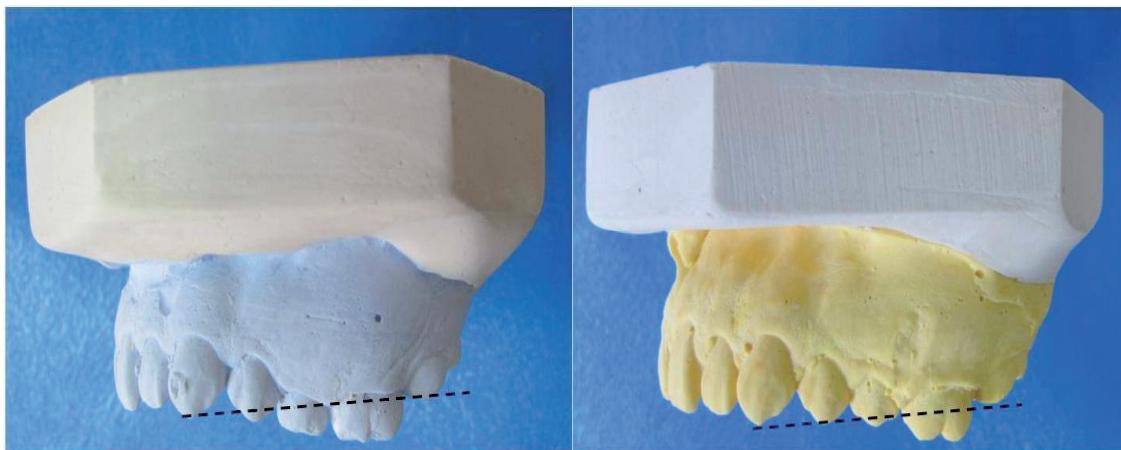


Figure 7. Pre and post-treatment cast models.

Discussion

Chemotherapeutic agents such as arsenic trioxide and paraformaldehyde were commonly employed as pulp-necrotizing agents in the past to devitalize inflamed pulpal tissue. In dentistry, arsenic trioxide, a water-soluble compound, has been used in a dental paste form. Due to its dissolving capacity, this agent has a potential for leakage not only from the dental cavity into the gingiva, but also through the apical foramen and accessory canals to the periodontal tissues (1-3).

Arsenic and its compounds are reported to have extreme cytotoxic and carcinogenic potential on hard and soft tissues, which eliminated them from clinical dental practice especially after the development of effective local anesthesia techniques. However, some cases are still encountered where patients suffer large tissue damage due to the use of pulp-necrotizing pastes (4-7). This report presents the orthodontic treatment of a case, where the leakage of the arsenic trioxide caused wide periodontal tissue damage in the mandible and this has led to the loss of mandibular teeth, extrusion of antagonist teeth and prosthodontic problems consecutively. The patient had to undergo complex dental treatment procedures while she could have only received endodontic treatment for the molar tooth. Overerupted maxillary molar teeth had to be intruded in order to restore the upper occlusal plane

and a functional occlusion. For this purpose, one miniscrew was placed on the buccal alveolar bone and used as the direct anchorage unit. Miniscrew implants are available in different lengths and diameters to accommodate placement at different sites in both jaws and they have been reported to be biocompatible (8-10).

Miniscrew anchorage is reported to be used in many cases, such as the correction of deep overbites, closure of extraction spaces, correction of a canted occlusal plane, alignment of dental midlines, extrusion of impacted canines, extrusion and uprighting of impacted molars, molar intrusion, maxillary molar distalization, distalization of mandibular teeth, en-masse retraction of anterior teeth, molar mesialization, upper third molar alignment, intermaxillary anchorage for the correction of sagittal discrepancies, and correction of vertical skeletal discrepancies that would otherwise require orthognathic surgical procedure (11). Miniscrew anchorage is especially useful for tooth intrusion, because it can apply a low, continuous force without causing reciprocal movements of other teeth (12-14). Under constant loading with medium forces of 150 to 200 g from elastic modules, the molars intrude, whereas the implants remain stable (15).

An intrusion force, directed upwards, was applied with elastic power chains between the archwire and

the miniscrew. The orientation of the intrusive force from the implants to the molar attachments determines the direction of the tooth movements. In this case, the point of force application was more buccal than the center of rotation of the teeth; which would cause the teeth to tip buccally during intrusion. Buccal tipping of the teeth was not desired and had to be prevented. The TPA was used to fix the intermolar width and it was rigid enough to prevent buccal tipping of teeth. Additionally, the TPA was constructed 5 mm away from the palatal tissue and an acrylic button was included. This was used to decrease the space of the tongue to obtain an intrusive force from the palatal side at the same time, with the pressure of the tongue. It is accepted that if the transpalatal arch crosses the palate 2 to 3 mm away from the mucosa, tongue forces during swallowing will assist the molars and they will be intruded by vertical tongue forces during swallowing (16).

In a study by Chiba et al, the maximum tongue pressure value on the loop of TPA was obtained when the loop was at the level of 2nd molars and a distance of 6 mm from the palatal mucosa (17). The finding that the bicuspid intruded more and parallel than the molar might suggest that the rate of intrusion was dictated by the number of the roots.

The bony resistance from the three roots of a molar may exceed that of a single root bicuspid. However, the intruded teeth and the affected bone responded well to the intrusive loading while the force applied was mild and constant.

Conclusion

Direct anchorage from a miniscrew is useful for tooth intrusion to apply a low, continuous force without causing reciprocal movements of other teeth, especially in cases where segmental orthodontic mechanics is necessary.

Source of funding

None declared

Conflict of interest

None declared

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