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Case Report

Multipurpose orthodontic system using palatal implants for solving extremely complex orthodontic problems

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ABSTRACT

Asymmetrical treatment mechanics are one of the most complex treatment options. Three dimensional force analysis must be completed, then approaches that can produce a three dimensional force system, such as palatal implants, are beneficial. A 37-year-old female with skeletal Class III required very complex mechanics because the maxillary right side showed a transpositioned second premolar, ectopic eruption of the second molar, large periapical lesion of the lateral incisor and the left side showed a high canine. The treatment plan involved extraction of the maxillary right lateral incisor, right first molar, left second premolar and third molar, as well as right quadrant mesialization and left quadrant distalization from a maxillary palatal implant. Consequently, the transpositioned maxillary right second premolar and ectopically erupted second molar were mesialised 14mm and 8mm respectively. Satisfactory improvement of the overjet and overbite, and good intercuspation were obtained. Active treatment was completed in 2 years 9 months. Complex treatment mechanics, such as asymmetric force systems, can be created using this palatal implant.

1. Introduction

Asymmetrical treatment mechanics are one of the most complex treatment options for a practitioner, which can lead to longer treatment times. Cases involving unilateral extraction and surgical intervention can make the treatment time even longer [1,2]. A thorough, three-dimensional force analysis must be completed before the start of orthodontic therapy to avoid unwanted side effects. The prognosis for successful outcomes could be compromised by a misdiagnosed asymmetry [3,4]. For difficult tooth movements, such as distalization, mesialization, and intrusion of molars, skeletal anchorage can be used with fewer undesirable reciprocal tooth movements [5–8].

Previously, skeletal Class III cases involving asymmetry, using the palatal implant (i-station; Okada Medical Supply, Tokyo, Japan), were introduced [9,10]. A key feature of the i-station is that the upper unit can be changed into several different modes and shapes; this allows the i-station to treat a wide variety of cases, including very severe cases (Fig. 1) [11].

This article focuses on asymmetrical treatment mechanics. The case required very complex mechanics due to transposition and ectopic eruption, and necessitated extraction of lateral incisor and molar impactions.

2. Etiology and diagnosis

A 37-year-old woman presented with two chief complaints: a high upper left canine and impacted mandibular molars. As shown in Table 1, she had a long list of orthodontic problems. Her face was almost symmetrical; however, a concave profile and lower lip protrusion were observed (Fig. 2). The oral examination showed severe maxillary crowding involving #15 transpositioned posterior to #16, buccal ectopic eruption of #17, a high #23, and #37 and #47 were completely embedded. Anterior and lateral crossbite on the left were present. Canine relationships were Class III on both sides, whereas molar relationships were Class II and also showed molar disocclusion.

According to the panoramic radiograph, both #36 and #46 showed distal tipping and dilacerated roots, #37 and #47 were embedded in the mucosa and had become stuck in the curve of #36

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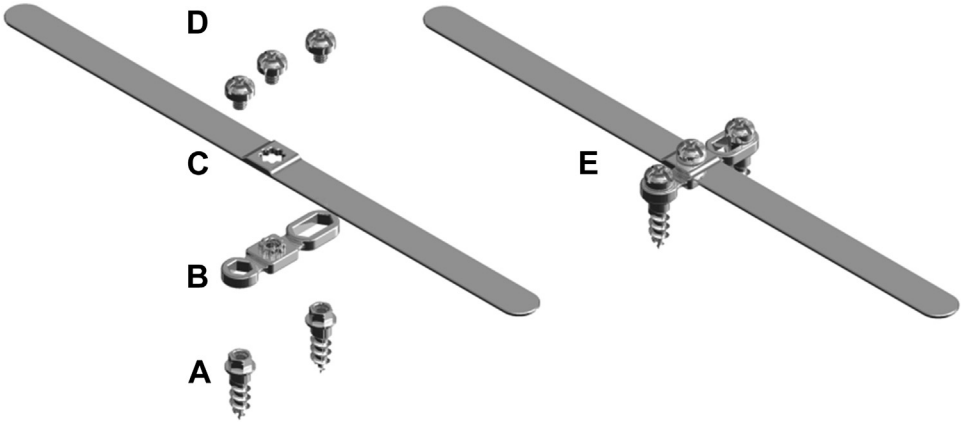

Fig. 1. Schematic diagram of i-station. (A) i-screws. (B) i-platform. (C) i-arm. (D) i-caps. (E) Assembled i-station.

and #46, and #38 and #48 exhibited mesial tipping directly over #37 and #47. Tooth #12 displayed a large periapical lesion, thus poor prognosis was expected. Tooth #25 had previously undergone endodontic treatment (Fig. 3).

Cephalometric analysis confirmed maxillary and mandibular protrusion (sella nasion point A, 88.8°; sella nation point B, 88.2°) and a skeletal Class III relationship with a Wits appraisal of −6 mm and an A point, nasion, B point of 0.6°. Maxillary and mandibular incisors showed normal inclination (upper central incisor to Frankfort horizontal plane, 110.4°; incisor mandibular plane angle, 91.0°) and the interincisal angle (130°) was also normal (Table 2).

She was diagnosed with skeletal Class III relationship, anterior and left-side lateral crossbite, embedded #37 and #47, transposition of #15, ectopic eruption of #17, and lateral openbite malocclusion.

2.1. Treatment objectives

Because #12 had a large periapical lesion, which leads to a poor prognosis, extraction was indicated (Fig. 4A). After the extraction of #12, it would be substituted by #13, and then #14 substitutes #13. In a case like this, usually the transposed #15 would be extracted; however, because #12 had to be extracted, it was decided to keep #15 and extract #16, leaving four teeth anterior to the molars. Thus, #15 needed to be displaced 14 mm mesially. Tooth #17 would substitute the extracted #16, and #18 would be used as a #17. On the left, #25, which had undergone endodontic treatment, and #28 were to be extracted. Teeth #24 and #26 were to be moved distally to make space to align the blocked out #23. It was concluded that the right quadrant would be mesialized, and left quadrant distalized using an i-station.

In the mandible, as previously mentioned, extraction of the impacted #37 and #47 was too difficult. In cases like this, usually #38 and #48 would be extracted and temporary anchorage devices (TADs) placed in the retromolar pad to upright #37 and #47. However, in this case, #37 and #47 might not upright because they were thoroughly stuck in the first molars. Also, because the patient had rejected using TADs for being too surgically invasive, uprighting #37 and #47 would be impossible. This case required en masse distalization, however, distalizing #36 and #46 would be difficult due to their dilacerated roots. Additionally, because they were already distally tipped, distalization would cause extreme tipping.

For these reasons, it was decided to extract #36 and #46 (Fig. 4B). Fortunately, #37, #47, #38, and #48 were mesially tipped, meaning distalization by uprighting using Class III elastics would be relatively simple and en masse distalization could be performed simultaneously, also using Class III elastics. For this treatment method, patient compliance using Class III elastics was very important. After many consultations, the patient understood the situation and promised to comply.

Table 1
Problem list

1. Severe maxillary crowding
2. #12 displayed a large periapical lesion
3. #15 transpositioned posterior to #16
4. Buccal ectopic eruption of #17
5. High #23
6. #25 had undergone endodontic treatment.
7. #36 and #46 showed distal tipping and dilacerated roots
8. #37 and #47 were embedded in the mucosa and had become stuck in the curved roots of #36 and #46
9. #38 and #48 exhibited mesial tipping directly over #37 and #47
10. Anterior crossbite and lateral crossbite on the left
11. Class III canine relationships
12. Class II molar relationships with molar disocclusion
13. Concave profile and lower lip protrusion
14. Skeletal Class III relationship

2.2. Treatment alternatives

One alternative option would be to extract #12, #15, #17, #25, and #28. In the mandible, #36 and #46 could be extracted. Tooth #12 can be substituted with an endosseous implant, whereas #17 would be substituted by #18, and orthognathic surgery could be used for mandibular setback. The patient declined this treatment plan. With the exception of her lip protrusion, she was satisfied with her profile, and she decided that the surgery was too invasive, the hospitalization was too long, and it was too expensive.

Another option would be to extract #12, #15, #17, #25, #28, #34, #36, #44, and #46 and substitute #12 with an endosseous implant. By using the #34 and #44 extraction spaces, the mandibular incisors could be retruded; this would provide a positive overjet and overbite. However, premolar and first molar extractions would create a large space, which would most likely cause severe lingual inclination of the mandibular incisors; this would negatively affect the concave profile as well as causing gingival recession. For this treatment, she understood the necessity of extraction, but she wanted to minimize the number of teeth extracted. Also, she did not want artificial material in her mouth permanently.