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Improved Super-elastic Ti-Ni Alloy Wire for the Treatment of Adult Occlusal Plane Canting with a Gummy Deep Bite Case: A Case Report

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Abstract

We present a case of a 26-year-old adult woman who presented to our department with the primary complaint of an unattractive profile with a gummy smile. We first referred the patient to our Department of Oral and Maxillo-facial Surgery, but she refused to undergo our suggested treatment. Clinical examination revealed that teeth #26 and #46 were missing; additionally, a deep bite and occlusal plane canting were evident. To correct the occlusal plane canting, we performed ISW [1,2] (Improved Super-elastic Ti-Ni alloy) Yin-Yang wire, developed by Tokyo Medical and Dental University), followed by the use of a J-hook and intermaxillary elastics. Moreover, the ISW reverse curve was used for raising the deep bite. At the final stage, temporary orthodontic implants were used to correct the gummy smile. Finally, after this orthodontic treatment, an acceptable profile was achieved.

Key words: Skeletal class II malocclusion; ISW; Gummy smile; Deep bite; Temporary orthodontic implants (TAD's)

Introduction

Anchorage in orthodontics is defined as "resistance to unwanted tooth movement." Dentists typically use adequate force to move teeth until the appropriate tooth alignment is achieved. According to Newton's third law of motion, a force is a push or a pull that acts upon an object as a result of its interaction with another object—for every action, there is an equal and opposite reaction. Anchorage refers to resistance to the force provided by other teeth or devices.

When adequate force is applied, other teeth or devices are inevitably moved. Maximum anchorage would be required if no other movement except that of the target teeth were allowed.

In recent years, the clinical use of temporary anchorage devices (TAD's) has been demonstrated to be effective in tooth alignment [3,4].

TAD's can exert not only retraction forces on anterior teeth but also intrusion forces on lower posterior teeth.

Case Study

Diagnosis and Etiology of Facial Asymmetry

A 26-year-old woman presented to our department with the primary complaint of excessive gummy upper smile and an unattractive profile. Extra- and intraoral examinations were performed. Facial examination revealed facial asymmetry accompanied with occlusal plane canting [Figure 1].

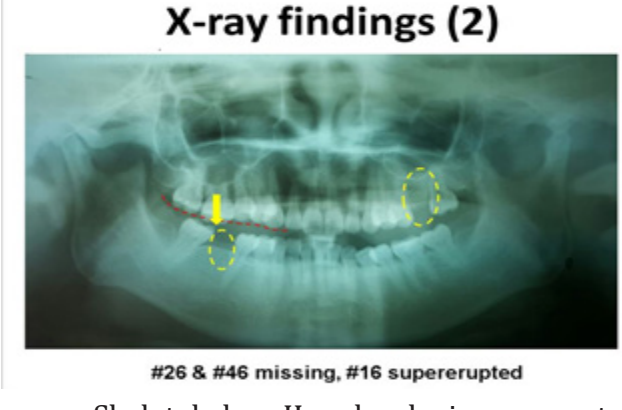
Figure 1: Pre-treatment extraoral photos

Intraoral views revealed an upper dental midline shift of approximately 1.0 mm to the right with respect to the facial midline [Figure 2].

Figure 2: Pre-treatment intraoral photos

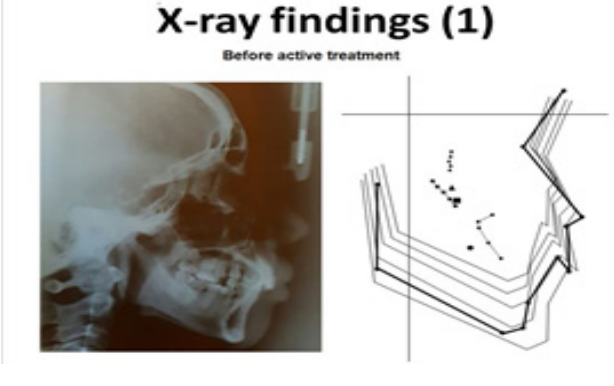
Clinical intraoral examination found teeth #26 and #46 to be missing and the presence of a deep bite and occlusal plane canting. Panoramic radiography revealed teeth #26 and #46 to be missing and #16 to be super-erupted [Figure 3].

Figure 3: Pre-treatment panoramic radiograph



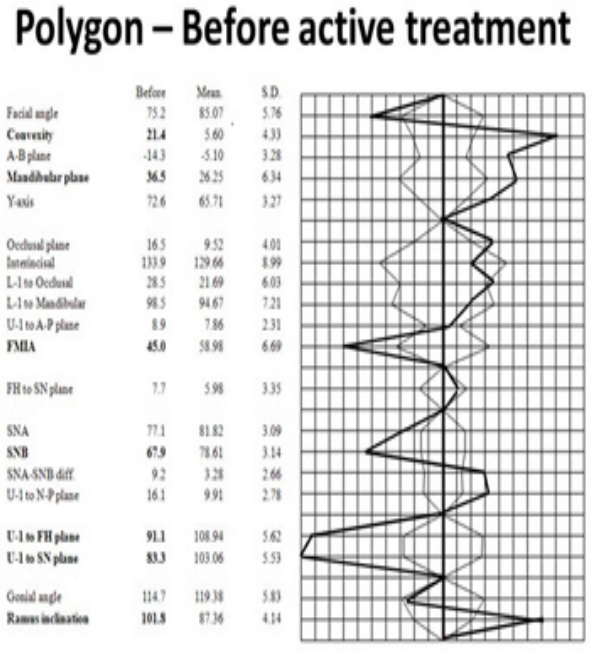
Skeletal class II malocclusion was noted on cephalometric radiographs, with no functional occlusion problems, and a convex profile was observed [Figure 4].

Figure 4: Pre-treatment cephalometric radiographs with profilogram



Pre-treatment cephalometric analysis was also performed. [Figure 5]

Figure 5: Pre-treatment cephalometric polygon



Treatment Objectives

After initial discussion, the patient was referred to the Department of Oral and Maxillo-facial Surgery. After consultation, she was recommended correction through orthognathic surgery combined with orthodontics treatment [5]. However, the patient refused to undergo this treatment.

The main treatment objectives were to improve the profile and correct the gummy smile [6].

After review, the following treatment plan and objectives were proposed:

1. Full-mouth DBS (direct bonding system).
2. Anterior tooth intrusion for gummy smile correction with J-hook or orthodontic implants.
3. Space closure.
4. Intrusion of upper-right first molar.

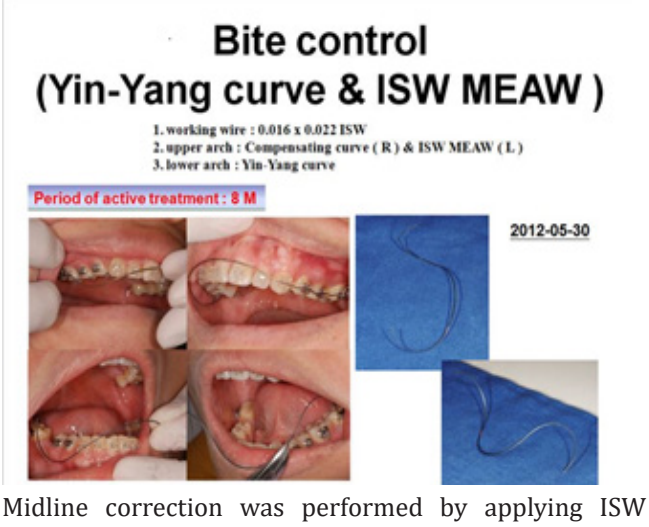
Treatment progress:

The patient began to receive active treatment in October 2011. Roth 0.018 brackets were applied over both arches, and leveling was performed with 0.016*0.022 ISW. Simultaneously, the mesial drive mechanic of 47 was started [Figure 6].

Figure 6: Start of active treatment: Upper and lower arch DBS, leveling with 0.016*0.022 ISW

Eight months after leveling with ISW, tooth alignment improved. To correct the deep bite and occlusal plane canting, the Ying-Yang curve was incorporated into the lower brackets [Figure 7].

Figure 7: Ying-Yang curve and ISW MEAW applied



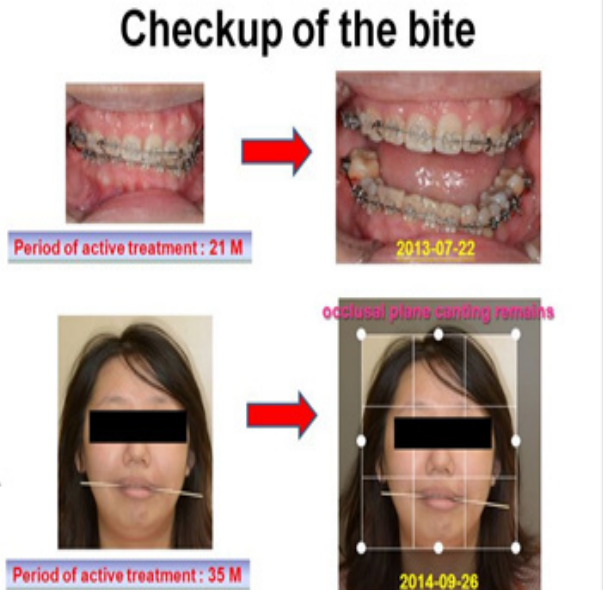
Midline correction was performed by applying ISW MEAW over the left side of the upper arch.

At the 14-month follow-up, we started anterior tooth intrusion and retraction by using the J-hook headgear to correct the upper gummy smile. To eliminate interference from the posterior teeth, only an anterior sectional wire was used [Figure 8].

Figure 8: J-hook headgear used to correct gummy smile

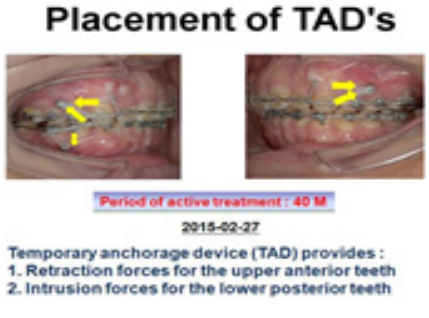
During the treatment period, we examined the amount of bite [Figure 9].

Figure 9: During treatment, bite check-up



After the 21-month treatment, occlusal plane canting [7] persisted. To correct this problem, TADs [8,9] were applied over both the right and left sides of the upper arch between the upper first premolar and second premolar to provide not only retraction forces for the upper anterior teeth but also intrusion forces for the lower posterior teeth [Figure 10].

Figure 10: Placement of TADs



Treatment results:

After 45 months of active treatment, the extraoral and intraoral appearances were improved[Figure 12] [Figure 13].

Figure 12: Post-treatment extraoral photos

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Figure 13: Post-treatment intraoral photos

The bite amount increased after treatment with 47 distal up-righting with subsequent mesial drive. The dental axis was corrected, and a more harmonious smile was achieved after treatment. Posttreatment cephalometric analysis[Figure 14] and superimposed cephalometric tracing[Figure 16] [Figure 17] [10] demonstrated changes in the A–B plane from −14.3 to −12.1, occlusal plane from 16.5 to 21.9, and L-1 to occlusal plane from 28.5 to 23.9. Dental analysis of pretreatment and posttreatment values revealed changes in the U-1 to FH plane from 91.1 to 96.5 and in the U-1 to SN plane from 83.3 to 88.7 [Figure 15]. Finally, acceptable dental parameters were achieved.

Figure 14: Post-treatment cephalometric radiographs with profilogram

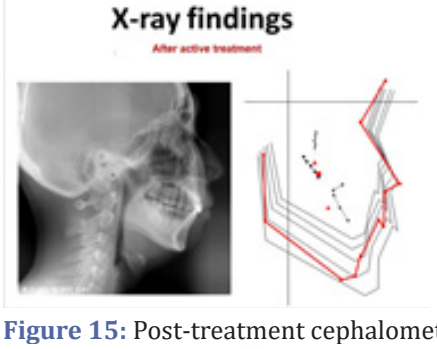


Figure 15: Post-treatment cephalometric polygon

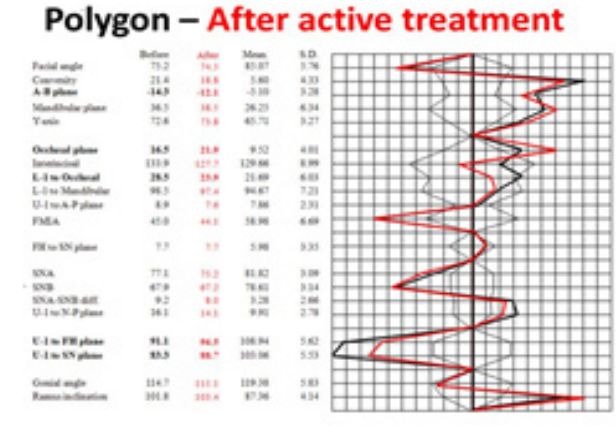


Figure 16: Superimposition of lateral cephalometric tracings. Red line: After treatment. Black line: Before treatment

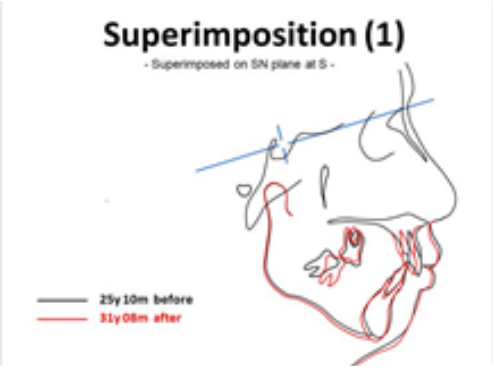
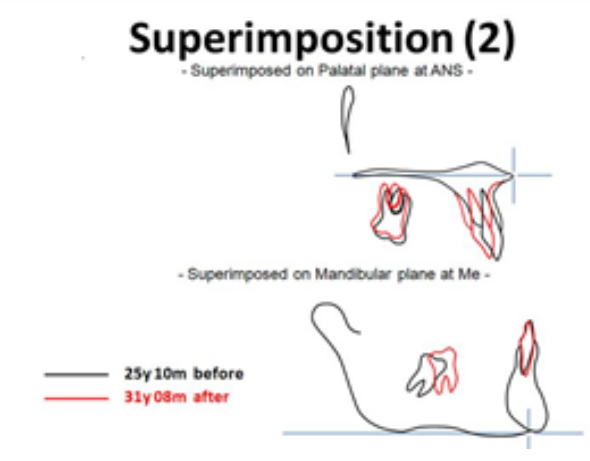


Figure 17: Maxillary superimposition and mandibular superimposition



At the end of treatment, we offered digitally designed aligners to be used as retainers over both the arches [Figure 11]. The treatment outcome was stable at several follow-ups.

Figure 11: Digital designed aligner as her retainers

Full mouth de-bonding of the brackets, we used digital-designed aligner as her retainers (for minor adjustment).

Discussion

Various ISW techniques are used for the treatment of adult occlusal plane canting combined with a gummy smile and deep bite. However, cases with a skeletal origin should be treated with orthognathic surgery [11].

When a patient chooses orthodontic treatment over orthognathic surgery, it is crucial to achieve acceptable outcomes.

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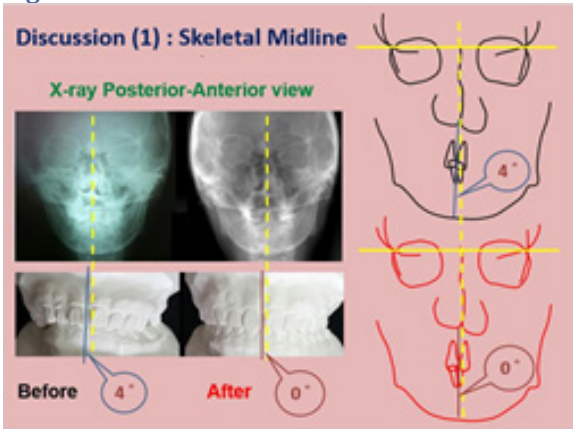
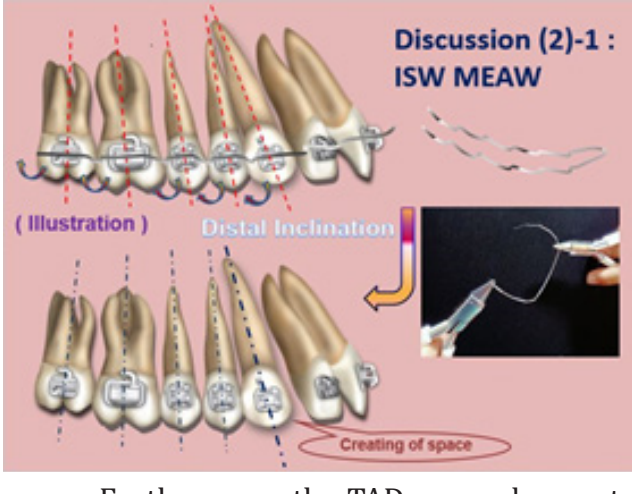
The dental angulation and skeletal midline were parallel at the end of the treatment [Figure 18].

Figure 18: Discussion: dental midline



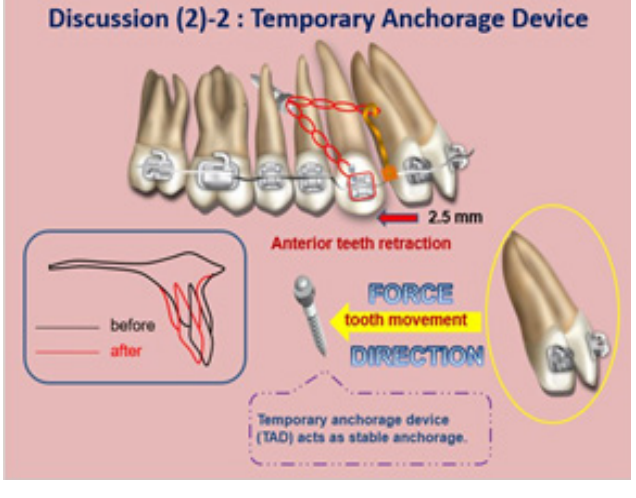
Several methods can be used to create space for anterior tooth retraction. In the present case, we applied the ISW MEAW technique. By using asymmetric MEAW, we could also correct the midline problem [Figure 19].

Figure 19: Discussion: ISW MEAW



Furthermore, the TADs served as a stable anchorage to retract the anterior teeth [Figure 20]. Finally, after orthodontic treatment, an acceptable profile was achieved.

Figure 20: Discussion: temporary anchorage devices



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