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Case Report

Segmental arch mechanics in Angle's Class I malocclusion with crowding: A case report

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ABSTRACT

An 18-year-old male presented with ectopically erupted upper and lower canines and Class I molar relation. First premolar extraction was planned to correct ectopic position of canines. Segmental 0.017 × 0.025" titanium molybdenum alloy (TMA) T-loop was used to retract the canines into an ideal position in the upper arch. After treatment, ectopically erupted canines were corrected, bilateral Class I molar connection was maintained, and incisor inclination was improved. At the end of treatment, the patient showed an improved smile.

1. Introduction

The retraction of the anterior teeth is an important part of fixed orthodontic appliance treatment. For the function, aesthetics, and stability of orthodontics, three-dimensional regulation of anterior tooth movement and precise positioning of teeth are required.[1–5] Individual canine retraction is the best option for patients with severe crowding, according to orthodontists·. When the canine is retracted using an appliance which applies forces buccally, the first order rotation must be considered for any unwanted movement. This cause the canine to move distally but also rotate mesio-distally due to a moment created. To counteract this moment a lingual attachment to the canine can be used. Thus, the resultant force will pass through the centre of resistance and thus an ideal bodily movement of the canine.[6–12]

Differential closure of extraction space in orthodontics is determined by situations that necessitate a precise analysis of the lingering issues. For the retraction of anterior teeth in maximum anchoring instances, segmental mechanics is frequently used. There are many advantages for segmental mechanics and T-loop is commonly used in this technique for the space closure. In the literature, there are few methods for the attachment of T-loops which includes attachment to Burstone's canine bracket or to the crimpable cross-tubes or to the crimpable double tubes or the prefabricated crimpable cross tubes from Ortho Technology attached to the anterior segment. All of these solutions necessitated new inventories, which increased overhead costs. This article, on the other side, focuses on a simple method for securing T-loops to the anterior segment for retraction in day-to-day clinical practise.

2. Case Report

An 18 -year-old male patient in the permanent dentition presented with the chief complaint of irregularly placed upper and lower front teeth. The patient had mesocephalic head, mesoprosopic facial form with a mild convex profile, and competent lips. The patient had Angle's class

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I molar relation. On skeletal class I jaw bases with horizontal growth, cephalometric examination revealed an orthognathic maxilla and mandible with proclined upper and lower anterior teeth. The patient had labially placed 13, 23, 33, 43 and lingually placed 12, 22, 32, 42. There were crossbites in relation to upper right and left lateral incisor. The overbite was 3 mm, with a 2 mm overjet. The maxillary midline had shifted 1 mm to the right from the facial midline. Carey's arch perimeter analysis showed 11 mm of tooth material excess in maxillary arch and 10 mm of tooth material excess in lower arch.

2.1. Treatment objectives

1. Creating space for correction of crowding through extraction.
2. Correction of displaced tooth.
3. Alignment of arches.
4. Midline shift correction.

2.2. Treatment plan

Following a comprehensive clinical and database analysis, a treatment plan involving extraction of the upper and lower first premolars with maximum anchorage protocol to achieve a symmetrical buccal occlusion, coinciding midlines, appropriate overjet, and adequate retraction of the proclined upper and lower anteriors was planned. To enhance the anchorage, transpalatal arch in the maxilla and lingual arch in mandible was given along with the T-loop.

2.3. Treatment progress

Segmental arch mechanics involving T-loop in upper arch and lower arch were followed. Preadjusted edgewise appliance with 0.022 slot MBT prescription (Ormco Mini 2000 brackets) was used. Alignment and levelling of anchor teeth were done with progressive archwire change. After alignment and levelling of anchor teeth, sectional 0.019 × 0.025" stainless steel arch wires placed in posterior segments and segmented 0.017 × 0.025" titanium molybdenum alloy (TMA) T-loop were employed at the bracket of ectopic canine and accessory molar tube. At subsequent appointments, the T-loop was activated by 3 mm. The distal arm was pulled and cinched distal to the first molar to activate it. The canines started moving distally, and complete retraction of individual canines was achieved in a period of 5 months.

After individual canine retraction, alignment, and levelling in both dentitions was accomplished with the following archwire sequence:

1. 0.016" nickel titanium arch wires
2. 0.016 × 0.022" nickel titanium arch wires
3. 0.017 × 0.025" stainless steel arch wires
4. 0.019 × 0.025" stainless steel arch wires

3. Treatment Results

The patients' smiles improved significantly as a result of the treatment. Maxillary and mandibular anterior teeth proclination with the crowding was corrected with good maintenance of the buccal occlusion, and Class I molar relation bilaterally maintained throughout the treatment with correction of the overjet and overbite. The maxillary and mandibular incisors were properly inclined after treatment, as evidenced by intraoral images and a lateral cephalogram. Protrusion of the maxillary and mandibular anterior teeth was corrected, and a Class I molar relationship, and an overjet and overbite, were maintained (Figures 4 and 5). The inclination of the upper incisors to the SN plane had decreased from 36 to 22 degrees, whereas the inclination of the lower incisors to the SN plane had decreased from 45 to 28 degrees. The movement of the maxillary and mandibular incisors contributed to correction of the soft tissue profile, and mentalis strain. The panoramic radiographs showed adequate root parallelism in both upper and lower arches.

Fig. 1: Pre-treatment extra oral and intraoral photographs

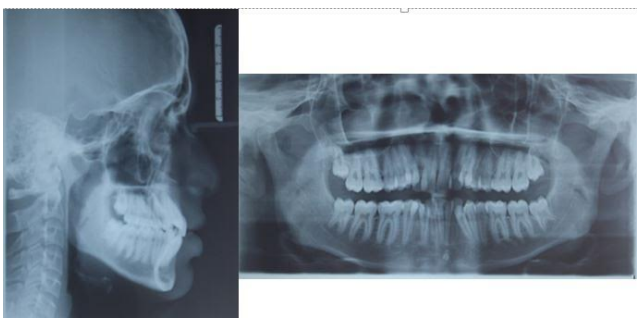

Fig. 2: Pretreatment radiographs

Fig. 3: Treatment progress

Fig. 4: Post treatment extra oral and intraoral photographs

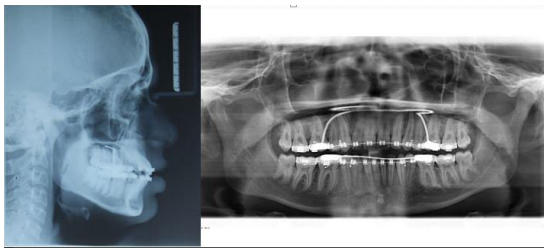

Fig. 5: Post treatment radiographs

4. Discussion

The T-loop has been recognized as an effective means to achieve desired tooth movement by differential moments between the anterior and posterior segments. The use of TMA wire and increase in the wire length help in reducing the load-deflection rate. Incorporating adequate alpha and beta bends to the loop can give rise to ideal moment to force ratio required for the tooth movement. As there is no sliding of the wire in between the brackets, the friction is not involved and hence helps with the anchorage control during the initial canine retraction. Although temporary anchorage devices have been widely used for anchorage reinforcement, there are unpredictable factors such as anatomical limitations and the possibility of failure. The T-loop, on the other hand, allows for accurate and predictable tooth movement control. The T-loop with a symmetric shape could be used to achieve a moment differential. As the extraction spaces close, maintaining the moment differential enhances anchoring control and force system predictability.

5. Conclusion

Precisely made T-loop produces the ideal moment-force ration for controlled tooth movement in all the three dimensions. Differential moments can be generated using T-loops which help in augmenting the anchorage. In conclusion, segmented 0.017×0.025" TMA T-loop is very useful in patients with extreme crowding and in cases requiring maximum anchorage.

6. Conflict of Interest

The authors declare that there is no conflict of interest.

7. Source of Funding

None.

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