International Journal of Medical and Dental Case Reports (2018), Article ID 190618, 3 Pages

CASE REPORT

Orthodontic treatment of a crowding case using segmental arch technique: A case report

Vaidya Mrudul, Pratham Pai, H. Jyothikiran, N. Raghunath, Abhishek Ranjan

Department of Orthodontics and Dentofacial Orthopedics, JSS Dental College and Hospital (Constituent College), JSS Academy of Higher Education & Research, Mysuru, Karnataka, India

Correspondence
Vaidya Mrudul, Department of Orthodontics and Dentofacial Orthopedics, JSS Dental College and Hospital (Constituent College), JSS Academy of Higher Education & Research, Mysuru - 570 015, Karnataka, India.
Phone: +91-7411844812.
E-mail: mrudul.vaidya31@gmail.com

Received 2 May 2018;
Accepted 20 June 2018

doi: 10.15713/ins.ijmdcr.93

How to cite this article:
Mrudul V, Pai P, Jyothikiran H, Raghunath N, Ranjan A. Orthodontic treatment of a crowding case using segmental arch technique: A case report. Int J Med Dent Case Rep 2018;5:1-3.

Abstract

A 14-year-old female 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 titanium molybdenum alloy T-loop was used to retract the canines into an ideal position in the upper arch, and Mulligan's bypass arch was used in the lower arch. Post-treatment results showed a correction of ectopically erupted canines, bilateral Class I molar relation maintained, and inclination of incisors improved. At the end of treatment, the patient showed pleased smile with improved smile arc.

Keywords: Mulligan's bypass arch, segmental arch, T-loop

Introduction

Anterior teeth retraction represents a fundamental phase of fixed orthodontic appliance treatment. Three-dimensional control of anterior teeth movement and correct positioning of teeth are essential for the maintenance of function, esthetics, and stability of orthodontic treatment.[1,2]

Space closure stage of orthodontic tooth movement is achieved through two types of mechanics. The first type is sliding mechanics and involves either moving brackets along an archwire, which is sliding the archwire through brackets and tubes. This leads to friction, which results in adverse rotational movements and decreased tooth movement and increases in anchor requirements or both. Therefore, the name friction is often associated with it.[3,4]

In the second type, frictionless mechanics, i.e. loops can be fabricated in a segmental or full archwire and closing loops are usually used in loop mechanics for the extraction of space closure. The major advantage of segmental loop mechanics is the lack of friction between the bracket and archwire during space closure. The disadvantages associated with this technique are the undesired tooth rotations in the transverse, sagittal planes and are time consuming in fabricating the loops.[5,6]

Case Report

A 14-year-old female 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 incompetent lips. The patient had Angle's class I molar relation. Cephalometric analysis indicated an orthognathic maxilla and mandible with proclined upper and lower anterior teeth on skeletal class I jaw bases with horizontal growth pattern. The patient had highly place 13 and 23. The overjet was 1 mm, and the overbite was 2 mm. The maxillary midline had shifted 1 mm to the right from the facial midline. Carey's and arch perimeter analysis showed 10 mm of tooth material excess in maxillary arch and 7 mm of tooth material excess in lower arch.

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, midline correspondence, appropriate overjet, and adequate retraction of the proclined

upper and lower anteriors was devised. Absolute anchorage was planned to retract canines and prevent mesial movement of the molars. To enhance the anchorage, T-loop was planned along with transpalatal arch in the maxilla. Mulligan's bypass arch was considered in the mandible.

Treatment progress

Segmental arch mechanics involving T-loop in upper arch and Mulligan's bypass arch in lower arch was considered for this case.

MBT appliance with 0.022 × 0.028" slot was used. Alignment and leveling of anchor teeth were done with progressive archwire change. After alignment and leveling of anchor teeth, sectional 0.019 × 0.025" stainless steel archwires 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. T-loop was activated by 3 mm at subsequent appointments. The activation was done by pulling the distal arm and cinching it distal to the first molar. Mulligan's arch was used in the lower arch which was made by 0.018" stainless steel wire.[7,8] The Mulligan's arch was placed at molar and canine, and incisors were bypassed. E chain was engaged between molar hook and canine hook. The canines started moving distally, and complete retraction of individual canines was achieved in a period of 5 months.

Figure 1: Pre-treatment photographs

Figure 2: T-loop and Mulligan's bypass arch placed

After individual canine retraction, alignment, and leveling, both dentitions was accomplished with following sequence of archwires [Figures 1-4]:

a. 0.016" heat activated nickel titanium archwires
b. 0.016" stainless steel archwires
c. 0.016 × 0.022" heat activated nickel titanium archwires
d. 0.017 × 0.025" stainless steel archwires
e. 0.019 × 0.025" stainless steel archwires along with NiTi closed coil spring to close remaining extraction space closure in maxillary and mandibular arch.
f. 0.017 × 0.025 HANT with second molar banding in maxillary and mandibular arches.
g. 0.019 × 0.025 TMA placed in maxillary and mandibular arches.
h. 0.021 × 0.025 braided NiTi in maxillary and mandibular arches with settling elastics.

Treatment Results

The post-treatment results for the patients showed excellent improvement in smile. 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

Figure 3: Mid-treatment photographs

Figure 4: Post-treatment photographs

correction of the overjet and overbite. Post-treatment intraoral photographs and lateral cephalogram showed that the maxillary and mandibular incisors were inclined appropriately. The panoramic radiographs showed adequate root parallelism in both upper and lower arches.

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.[9]

Although temporary anchorage devices have been widely used for anchorage reinforcement, there are unpredictable factors such as anatomical limitations and the possibility of failure. However, precise control of tooth movement is possible in a predictable manner with the T-loop. The T-loop with a symmetric shape could be used to achieve a moment differential. Maintenance of the moment differential as the extraction spaces close improves anchorage control and force system predictability.[10,11]

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 cases with extreme crowding and in cases requiring maximum anchorage.

References

1. Braun S, Sjursen RC Jr, Legan HL. On the management of extraction sites. Am J Orthod Dentofacial Orthop 1997;112:645-55.
2. Felemban NH, Al-Sulaimani FF, Murshid ZA, Hassan AH. En masse retraction versus two-step retraction of anterior teeth in extraction treatment of bimaxillary protrusion. J Orthod Sci 2013;2:28-37.
3. Pacheco MR, Jansen WC, Oliveira DD. The role of friction in orthodontics. Dent Press J Orthod 2012;17:170-7.
4. Rossouw EP. Friction: An overview. Semin Orthod 2003;9:218-22.
5. Burstone CJ, Koenig HA. Optimizing anterior and canine retraction. Am J Orthod 1976;70:1-20.
6. Burstone CJ. The segmental arch approach to space closure. Am J Orthod 1982;82:361-78.
7. Mulligan TF. Common sense mechanics. J Clin Orthod 1980;14:336-42.
8. Mishra HA, Mishra RK. An approach with hybrid segmental mechanics. J Clin Diagn Res 2016;10:ZD18-21.
9. Vaidya M, Jyothikiran H, Raghunath N, Pai P. Extraction versus non-extraction: A retrospective study. Int J Orthod Rehabil 2018;9:23-6.
10. Sanjay N, Rajesh RN, Scindia R, Ajith SD. Space closure with loop mechanics for treatment of bimaxillary protrusion: A case report. J Int Oral Health 2015;7:65-7.
11. Matsui S, Otsuka Y, Kobayashi S, Ogawa S, Kanegae H. Time-saving closing loops for anterior retraction. J Clin Orthod 2002;36:38-41.