

Individual Canine Retraction Using Modified Segmental Mechanics

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Abstract

Canine retraction is a very important step in treatment of patients with crowding, or first premolar extraction cases. In severe crowding cases, until the canines have been distalized to relieve the crowding, space to correctly align the incisors will not be available. Correct positioning of the canines after retraction is of great importance for the function, stability, and esthetics. Improper position of the canine during retraction can lead to taxing of the anchorage and increased treatment time. In this case a modified transpalatal arch was used to aid in avoiding the unwanted moment caused by the loop and produce more of a bodily retraction of the canine and at the same time decrowding of the anteriors were also achieved.

Keywords: Canine Retraction; Decrowding; Segmental Mechanics

Introduction

Most of the patients approach the orthodontist with their prime issue being their appearance. Little do they know what kind of malocclusion they possess underneath. Studies have shown that malocclusions have an obvious physical as well as psychological, and social consequences that affect the quality of life [1]. The patient expects the treatment to improve their overall appearance which in turn increases the acceptance by their peers.

The tooth material to the arch length is one of the major criteria which can be observed for any crowding present in the given arch [2]. The prevalence of ectopically placed canine or its impaction is about 1 - 2% [3-10]. Palatally displaced canines occur twice as much as that of the buccally displaced canine [3,4].

From an orthodontist stand point, cases with severe crowding, its ideal to go for an individual canine retraction. 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 (Figure 1). This case report showcases the use of buccal and lingual force to achieve bodily tooth movement.

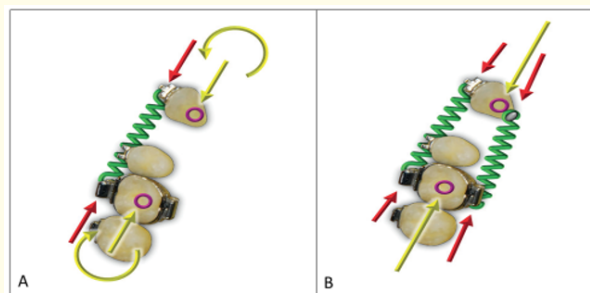


Figure 1: (A) 3-D force system from separate canine retraction. The force is applied buccally (red arrow) to the CR in the occlusal view. The replaced equivalent force system (yellow arrow) at the occlusal CR shows that the canine will rotate. (B) Using an additional lingual attachment for separate canine retraction by adding additional force on the lingual side of the canine, the resultant force (yellow arrow) passes through the CR. (Obtained from "The Biomechanical Foundation of Clinical Orthodontics" Charles J. Burstone).

Clinical Examination

A 16-year-old male patient reported to the department with a chief complaint of irregularly placed upper and lower front teeth. On intraoral examination he had an angle's class I molar relation. Crowding was seen with respect to both upper and lower anteriors along with proclination. An overjet of 3 mm was seen with an overbite of 1 mm (Figure 2).

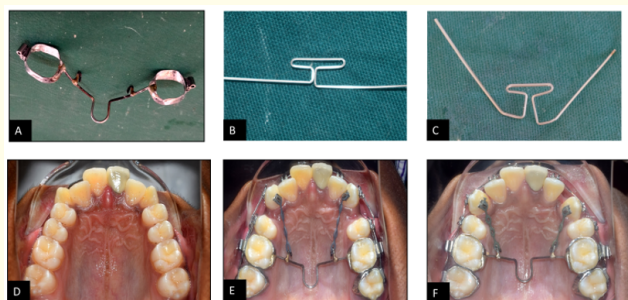


Figure 2: (A) Modified TPA with soldered hooks. (B) T-loop (C) Activated T-loop (D) Pretreatment occlusal photograph (E) Pre-retraction occlusal photograph (F) Post-retraction Occlusal photograph.

Treatment plan

After a thorough diagnosis, extraction of all the first premolars was devised along with maximum anchorage reinforcement with the help of a modified TPA in the maxillary arch and a lingual arch in the mandibular arch. Individual canine retraction was to be done using a segmental T-loop in the maxillary arch in both the quadrants and a Mulligan's bypass was used in the lower canine retraction.

Treatment progress; time and mechanics used

After the extraction of all the first premolars, a segmental approach was considered to be apt to distalize the canines. A modified TPA along with a T-loop was used in the upper arch while a Mulligan's bypass was used for the lower arch. The TPA was fabricated with 0.9mm SS and modified by soldering on two hooks on the either side of the U-loop of the TPA. The T-loop was fabricated using 17 x 25 TMA wire while the Mulligan's bypass using the 0.018 Australian archwire (Figure 2A-2C).

The canines in the first and second quadrant were given attachments on the lingual side to which E-chains were engaged from the hooks of the TPA. The T-loops on the either side were activated by pulling the distal ends which passes through the accessory tube in the molar tube of the first molars.

The canines in the third and the fourth quadrant were retracted by using the Mulligan's which bypasses the anterior teeth. E-chains were placed from the canine hooks to the molar hooks (Figure 2D-2F). The canines were successfully retracted in a time period of 5 months (Figure 3).



Figure 3: Comparison. Pre-treatment (A, B, C, D, E), Pre canine retraction (F, G, H, I, J) and post canine retraction (K, L, M, N, O).

Discussion

The ectopic eruption of the canine may be broadly classified under systemic and local factors. According to McBride, "The failure of permanent teeth to erupt into their normal position in the dental arches is usually due to a discrepancy between tooth size and over-all arch length [11]. According to Moyers [12], the maxillary cuspid follows a more difficult and tortuous path of eruption than any other tooth. This may also be one of the factor leading to its displacement out of the arch. The ectopic eruption of the canine may sometimes occur even though there is adequate space in the arch. The reason might be due to some abnormal genetic pattern and this condition is known as the "primary tooth germ displacement" [13].

The extraction of all the premolars and the retraction of the canines individually would be the most efficient way of decrowding the anterior segment along with repositioning of the irregularly placed canines. The use of T-Loop in the maxillary arch is an effective way of tooth movement which utilizes the differential moments. By incorporating the right pre-activated bends in the T-Loop, it helps us to achieve the ideal moment to force ratio. The ideal wire of choice would be TMA as it has reduced load deflection rate and the increased length of the wire used in the T-loop also aids in doing the same.

The TPA used here not only helps in reinforcing the anchorage but the modification (the additional hooks) helps in retraction of the canine more bodily as the force is directed both buccally with the help of the T-Loop and lingually using the hooks from the TPA attached to the lingual portion of the canine. In the mandibular arch the use of mulligans bypass retracts the canines into the extraction spaces while the lingual arch reinforces the anchorage.

In both the maxillary and mandibular retraction method we only retract the canines into the extraction spaces with minimum anchorage loss. By doing this we can also notice that the anteriors slowly start decrowding on its own. Thus, we obtain a maximum anchorage along with tooth movement in a more natural way.

Conclusion

The use of segmental mechanics can be ideal in few situations and may also reduce the unwanted movements caused by using a continuous mechanics. Individual canine retraction here not only helps in distalizing the canine but also decrowding of the anterior segment at the same time. The use of T-loop is efficient in an individual canine retraction but may cause some unwanted moment of the tooth. Therefore, a modification in the TPA along with T-loop generated more of a bodily movement which is more efficient rather than just using a T-loop.

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