A newer simultaneous space creation, eruption, and adjacent root control spring for the management of impacted tooth

DIPTI SHASTRI, PRADEEP TANDON, GYAN P. SINGH, ALKA SINGH

Abstract

Usually, treatment of impaction includes: Welcome preparation (to create space), surgical exposure and attachment to the impacted tooth and the orthodontic guidance for the eruption of the impacted tooth. Sometimes, due to deficiency of space, creation of space for impacted tooth requires first, and space regaining efforts may require the distal movement of posterior teeth and or mesial movement of anterior teeth in the arch, but it may create some problems. To overcome the unwanted problem in this clinical situation and to reduce overall treatment duration of the patient, we have developed the Simultaneous space creation, Eruption and Adjacent root control spring to control crown as well as root movement.

Key words: Labial canine impaction, simultaneous space creation, eruption and adjacent root control spring

Introduction

When all possibilities of natural eruption of impacted tooth have been exhausted, surgical exposure and orthodontic guidance of eruption is usually considered after complete root apex formation. The steps in surgically assisted orthodontic guidance are: Welcome preparation, surgical exposure and attachment to the impacted tooth and the orthodontic guidance for the eruption of the impacted tooth. Welcome preparation includes creation of sufficient space in the arch before surgical exposure and alignment of impacted tooth. Space regaining efforts may require the distal movement of posterior teeth and or mesial movement of anterior teeth in the arch. Open Ni-Ti coil spring is commonly used to create space but as we observed that it creates space at crown region mostly, and roots of teeth lying adjacent to impacted teeth tip towards each other and creates hurdle in the eruption procedure. To cater the unwanted problem in this clinical situation and to reduce overall treatment duration of the patient, we have developed the Simultaneous space creation, Eruption and Adjacent root control (SEA) spring. If the tooth is very highly placed in the vestibule then we can initiate ortho-eruption with space creation simultaneously with the SEA spring. Space requirement was not only in the coronal region, but also in the radicular region adjacent to the crown of an impacted tooth.

Case Report

An 18-year-old female was referred with an unerupted maxillary permanent left canine. The patient had Angle’s Class I molar relationship and missing maxillary left canine with pleasing profile [Figure 1a]. The overjet was 3 mm, and the overbite was 2 mm. Space loss had occurred in the region of the impacted canine (available space = 5 mm). Orthopantomogram (OPG) examination showed that the impacted maxillary left canine was in sector IV angulation to the midline was 40, and distance from the occlusal plane to the tip of the crown was 17 mm [Figure 1b]. Patient underwent closed eruption technique followed by bonding to the lingual button, which was replaced by a bracket at the time of eruption. The closed eruption technique was applied as it is best method proven for the labially impacted teeth to get through attached gingival though the patient was advised to maintain proper oral hygiene, but the compliance of the patient regarding maintenance of oral hygiene was poor, so the mucogingival junction was seen to be compromised. In the following case, maxillary left canine lies high and deep at the proximity of the root of the maxillary left incisor, the SEA spring was fabricated to create adequate space for alignment purpose with the optimum amount of force for the eruption and monitor the root angulations of adjacent teeth. Total treatment duration of impacted
canine alignment was 14 months in the above case. Finally, the fixed retainer bonded from canine to canine with essix retainer.

**Fabrication of the simultaneous space creation, eruption and adjacent root control spring**

1. Archwire was fabricated with 019 × 025 TMA wire; a step was made to reach the bracket slot of lateral incisor with distal inclined arm of 20° distal angulation [Figure 2a (A)]
2. Mesial inclined arm was fabricated 15° mesial angulation of the bracket slot of 1st premolar [Figure 2a (G)]
3. Space between the teeth was measured, and helix of diameter 1.5 mm was made. The wire was straightened and another helix of diameter 1.5 mm was made with greater inter helix distance [Figure 2a (B)] then the measured value [Figure 2a (B)] between the teeth.

**Biomechanics of simultaneous space creation, eruption, and adjacent root control spring [Figure 2d and e]**

**Distal inclined arm**
It engages in lateral incisor bracket and moves the root of the tooth in the mesial direction away from the crown of the impacted canine to provide a space for its eruption.

**Mesial inclined arm**
It engages in maxillary left first premolar bracket and moves the root distally.

**Helices distance (b)**
It is larger than the measured value (b) and as it engages in between them as the clinical situation required to get the desired direction of orthodontic traction (elastic thread, E-chain, Ni-Ti closed coil spring, ligature wire with module).

Due to the mesial and distal inclined arm roots of the adjacent teeth from impacted tooth is moves distally, and the tipping effects of crown was prevented by close contact of helix with wings of their bracket and figure of 8 on both mesial and distal segments of the impacted teeth. Providing the space at this region helps to shift crown of the impacted teeth toward mid-crestal region. In general, the force required to move the impacted canine in vertical as well as in the distal direction for uprighting of the tooth. The resultant force was applied with the help of the module with ligature wire [Figure 2c] of value of 100 g at 40° from the occlusal plane, which was resolved in distal vector with the approximately value of 75 g and the eruption or vertical value of about 60 g [Figure 2e]. The direction and value of traction force can be altered by the shifting the point of force application on separate helix. For example, if the distal most helix was used the distal traction force value increases and at the mesial helix the eruptive force value increases vice versa.

Comparing the initial OPG [Figure 1b] and final OPG [Figure 3b] after maxillary canine eruption, improvement in angulations of roots of adjacent teeth is markedly visible and path...
travelled by canine was well-appreciated in superimposition of OPG [Figure 3c].

Discussion

Indiscriminate use of open Ni-Ti coil spring in creation of space might tends to move the roots toward each other, which can hamper the eruption of impacted tooth. SEA spring was developed to manage this clinical situation. Advantage of SEA spring is that it provides space for impacted teeth, early initiation of the eruption procedure and correcting the root angulations of adjacent teeth simultaneously so that the chances of obstruction created by the adjacent root can be fully avoided, and we can save the total duration of treatment. Helix was preferred to maintain the desired amount of traction force by preventing the creeping of site ligation. SEA spring can be used unilateral, bilateral with a single helix, double helices, triple helices in different clinical situation in both maxillary and mandibular arch.

Total treatment duration of maxillary impacted canine alignment was 14 months in the above case.

Conclusion

The SEA spring is simple in design, easy in fabrication and versatile in nature so that we can monitor the angulations of the roots lying adjacent to impacted tooth which is more paramount factor to control, especially when it is deeply placed. It also provides the desired direction of traction force as we are free to apply force from the different helices. It is well-equipped to reduce the overall treatment duration by performing multiple task simultaneously. It will prove a well-efficient tool in the armamentarium of the orthodontist.

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