MODIFIED BALLISTA SPRING FOR IMPACTED MAXILLARY CANINE

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Abstract:

Malocclusions of impacted teeth are not uncommon. Many approaches with auxiliary springs have been reported till date for the correction of malocclusions. They had biomechanical, retentive and stability inherent in their designs. This article represents the innovative approach for orthodontic correction of impacted tooth, especially with light force appliance i.e: begg’s appliance where round wires are used in round molar tubes throughout the treatment. This modified spring is fabricated in 0.018 australian stainless steel wire, which may be anchored on round molar tube and desirable force vector may be applied in any of the three directions. Fabrication and its clinical application are discussed.

Keywords: auxiliary orthodontic spring, impacted tooth, impacted canine, cantilever spring

INTRODUCTION

The ectopic eruption of maxillary canine is frequently encountered problem. Lowest incidence of impacted canine is 0.27% reported in literature relates to Japanese population1. In Americans2,3 and israeli4, it is 1.5% while it is highest 7.9% in Icelandic population5 . Maxillary caninelaast in eruption sequence (except third molars) is most prevalent due to tooth size arch length discrepancy (TSDL).

In Begg’s light force appliance, various methods have been used, including the use of light wire springs, springs soldered to the heavy labial or palatal base wire and mousetrap loops bent in the archwires. With the use of these methods orthodontist had no precise control of direction of force6.

Ballista spring7 a unilateral spring made of round wire and is tied into one of the molar tube, lacks the versatility in its use. Seongang used auxiliary wire comprising 0.014 inch Australian Willcock wire8. In 1995, Kornhauser et al used labial spring auxiliary9. Orton in 1995 used a combination of the lower removable appliance and gold chain since this can be readily fabricated10. Magnets are also utilized for the correction of impacted canines11. Bowman and Carano introduced the Kilroy spring in 2003.13

FABRICATION

A 0.018 inch round stainless steel wire (Australian), ribbon arch plier, distal end cutter, scale and marking pencil are needed for fabrication of this spring2.

Fig. 1: Straight length piece of 8 cm wire bent to prepare a loop of 1 mm width for

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keeping one long and one short arm. Fold 5 mm length of loop.

To about 60° with respect to rest of the wire arms (Fig. 2).

**Fig. 2:** Loop is folded at 5 mm from its tip to about 60° with respect to rest part of the wire.

**Fig. 3:** Molar buccal adaptation curvature is prepared in loop. Curvature is limited to the 6 mm span of wire which later on forms the stabilizing arms in the spring.

**Fig. 4:** Bend the long arm to crossover short arm by about 60° to 70° from the side of previously folded loop. Therefore, span between crossover point and 5 mm loop section is about 6 mm known as ‘molar buccal adaptation curvature’.

**Fig. 5:** Short retentive arm bent perpendicular to the middle curved wire segment (molar buccal adaptation curvature) toward same side of the previously folded portion of the loop.

CASE REPORT DIAGNOSIS AND TREATMENT PLAN

A 12 year old boy reported to the department of orthodontics and dentofacial orthopaedics with the chief complaint of forwardly placed upper front teeth and missing tooth on the right side which was 12mm above occlusal level. Treatment plan called for extraction of all the 1st premolars. Position and angulation of impacted canine was found favourable and the orthodontic traction of impacted canine was planned. A bracket was bonded on the impacted canine and the flap was repositioned. A ligature wire was attached to the bonded bracket before repositioning the flap and its free ends were extended outside the flap. Modified ballista spring, made from 0.018 inch Australian SS wire, was placed on the right maxillary 1st molar tube. The active arm was set to exert an occlusal pull of about 2 to 3 ounces. Hook of the active arm of the MBS (modified ballista spring) was ligated to
the bracket on the impacted tooth with the ligature wire extended outside the flap. There was no evidence of soft tissue irritation, distortion of spring.

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DISCUSSION
The insertion of the retentive arm of this spring into the round buccal tube engages the buccal tube from the cervical, occlusal and buccal aspect, the elasticity of this versatile spring causes it to exert a force
when it returns to its original/neutral position, which resultantly applies an optimum force in a desired direction to the impacted tooth. Magnitude and vector of the force exerted by cantilever arm may be controlled in all three dimensions. Force level recommended for extrusion of impacted tooth range from 60 to 75 gm, which is easily attained with this type of spring. Force may be adjusted according to the type of movement required. This spring has less adverse effects on the adjacent teeth than the use of continuous flexible archwires. Furthermore, this spring can be used even if the malocclusion is limited to a single tooth, i.e. this type of spring does not require fully bonded appliance unless full arch corrections are warranted, rather treatment can be carried out without placement of complete bonded appliance on all teeth except first molars which are supported with a transpalatal arch. Adverse forces, tipping, and torquing movements on anchor molars may be controlled with a transpalatal arch between the two molars. Thus, it has wide range of applicability with the appliances having round molar buccal tube of dimensions 0.036 inch × 0.25 cm.

ADVANTAGES
1. Design of the spring is unique in such a way that although it is prepared in round wire and engaged in round molar tube it does not rotate or destabilize
2. It has wide range of clinical applicability with the appliances having round molar buccal tube of dimensions 0.036 inch × 0.25 mm, i.e. Tip edge appliances, Begg’s appliance and rectangular buccal tubes
3. Versatility of spring’s unique design allows it to be used in various conditions of correcting single tooth malposition in any arch, e.g. blocked-out canine or palataly impacted canine or premolar
4. Adverse effects on adjacent teeth are eliminated because no reactionary forces exerted on adjacent teeth
5. Light controlled and continuous force is generated by this spring to work over a long range of movement to bring the tooth to desired position
6. Two springs with active arms placed opposite in direction to each other can be used for correction of canting of occlusal plane
7. Its use can be extended for uprighting of the molars
8. Such type of spring can be removed and replaced without disengaging the continuous base archwire
9. More economical than any other previously reported approach. Spring may be prefabricated and kept in stock. Thus, reduce the chairside time while treating the patient.

REFERENCES

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