

# Impacted Canines Shines in the Arch with Ballista Spring : A Review

Dr. Anurag Rai

Professor, Deptt. of Orthodontics

Dr. Shweta Rai

Reader., Deptt. of O.M.F.S.

Dr. B.R. Ambedkar Institute of Dental Sciences & Hospital, Hariom Nagar, Patna.

## Abstract

The Ballista spring, used to bring unerupted tooth like Ballistic missile is a spring made from the Wilcock special plus wire. Wire is twisted around itself to generate force. The advantages of Ballista Spring are: Vertical traction along the long axis of the tooth, ease of placement and independence of other parts, bonding of anterior teeth not required and it can be used for any tooth, buccally as well as palatally. It has become Orthodontist delight.

**Key Word:** Canine Eruption, Ballista Spring.

Bishara and associate.<sup>1</sup> Von der Heydt<sup>2</sup>. Clark<sup>3</sup> and Lewis.<sup>4</sup> has worked on this spring. The physiology of eruption, the etiologic factors of the impaction, the sequelae of impaction, the diagnosis, and the different techniques are well-documented in different manners. The authors prove the skill of the surgeon and the orthodontist. Very often the method proposed for the marsupialization of the impacted tooth is complicated and has to be modified several times during the treatment.. The "ballista spring system" developed by Jacoby has advantage over the previously proposed system. Since the upper canines are most frequently impacted teeth with which orthodontists are concerned.

## Ballista Spring

The ballista spring is a 0.014, 0.016 or 0.018 inch round wil cock special plus wire, which accumulates its energy by being twisted on its long axis. Its anchorage extremity penetrates in both headgear and edgewise (or PEA) vestibular tubes of the first or second maxillary molar and is ligated to this tube. In this way, the wire cannot rotate in the tubes. The horizontal part of the wire accumulates the energy. This part of the wire is attached by a ligature on the first premolar, which allows it to rotate in the slot of the bracket as a hinge axis. The last part of the spring is bent down vertically and ends in a loop shape to which in ligature elastomeric thread can be attached. When the vertical portion of the spring is raised toward the impacted tooth, the horizontal part accumulates the energy

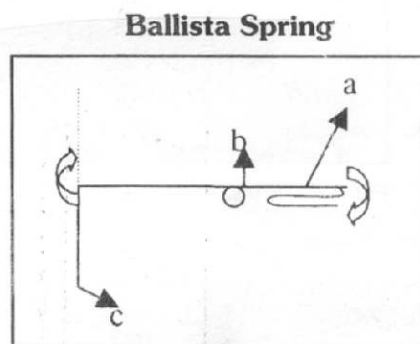


Fig. 1 a. Double backed portion entering the double tube on the molar around which the wire is twisted.  
b. Coil to increase the wire length, thus increasing the resiliency.  
c. Vertical arm with a loop to be tied to the canine.

into the twisted metal. When the vertical section is released, it bumps down like a "ballista". Hence it is known as Ballista Spring.

## The anchorage

The spring creates a torsion on the double tube of the molar. For this reason, the molar has to be well anchored by a transpalatal 0.045 inch wire to the contralateral molar. In the beginning, the first was not included in the transpalatal arch because the impression was that the spring rotates only in the slot of the premolar, like a hinge axis. In some case the premolar was intruded or shifted labially. Consequently, it was included in the transpalatal arch to maintain the original position.

Two molar bands with combination headgear and edgewise double tubes and two first premolar bands with twin or large edgewise brackets were fitted, and an impression was taken with the four bands. A lingual 0.045 inch round wire was welded to the four bands on the cast. The transpalatal wire must be posterior, between the molars, and in no case anterior (between the premolars). This avoids the wire's interference during the operation or during traction of the impacted tooth.

The four bands welded to the transpalatal arch must be cemented as a unit. This anchorage can be used in both unilaterally or bilaterally impacted canines.

## Surgical preparation of the impacted tooth

Determination of the location of the impacted tooth is highly recommended. Panoramic x-ray films give good information about the degree of inclination of the impacted tooth and about the surrounding tissues. The impacted tooth can also be localized by palpating the region of the impaction. In most cases a preeminence corresponding to the impacted tooth can palpated under the mucosa.

Anesthesia is provided by a local infiltration on the palatal and vestibular region. A small limited flap is raised over the impacted tooth. The superficial enamel of the impacted tooth is completely liberated from bone, enamel organ. and cuticula. No osteotomy in the proximal parts or around the tooth is required. A fenestration in the mucosal flap overlapping the exposed tooth is incised, and the rest of the flap is sutured.

Vanarsdall and Corn,<sup>5</sup> has emphasise the importance of the attached gingiva that remains after the retraction of labially impacted teeth. When dealing with unerupted teeth, the surgeon must carefully plan his flap and bring attached fibrous mucosa in contact with the operate tooth. In general, the palatally impacted tooth is surrounded by attached mucosa. On the contrary, the vestibular impacted tooth, or the lingually impacted tooth may be drawn through the loose gingival mucosa, and the final result could be a good orthodontic alignment with a poor periodontal mucosal attachment.

After the operation, a surgical cement [Zn(OE)<sub>2</sub>] is pushed into the fenestration in order to contact the exposed area of the tooth. This cement is inserted laterally in the retentive parts of the premolar's vestibular bracket and round the palatal 0.045 inch wire. No surgical acrylic plates are necessary.

This surgical procedure is called marsupialization, because the surgical cement avoids the covering of the tooth by the healing mucosa; the enamel organ fuses with the palatal mucosa of the fenestration, around the surgical cement.

Ten days after the operation, the surgical

cement and the sutures are removed, and a small 0.012 inch round wire hook is bonded to the exposed enamel surface of the canine through the fenestration. In order to apply the bonding material to the impacted tooth against the gravitation force, one has to choose a bonding composite which is applied with a thin brush. The ballista spring described above is inserted in the molar tubes, ligated to the molar and premolar, and the vertical part is carefully raised and ligated to the bonded hook on the canine by an elastomeric thread.

#### Force of the spring

The force of the spring is proportional to the diameter of the wire and to the length of the horizontal and vertical parts of the spring. A 0.016 inch spring of average size provides a force of 60 to 100 grams; a 0.018 inch spring of average size provides 120 to 150 grams. For a normal case, it is advisable to start with 0.016 inch wire and to change it to a 0.018 inch after a month. If after 2 months of treatment, no progress is registered because of severely impacted canines or tissues resistance, one can add a second spring in the same tube to increase the force operating on the impacted tooth.

Attention must be given to young patients with partially formed roots of the impacted tooth, especially when the tooth is straight, without axial inclination. In such a case, the tooth can be induced to erupt in 2 to 3 weeks by this system. Such a rapid eruption is not desirable since the tooth may become loose. In such a case, the treatment has to be started with a 0.014 inch wire, and should be checked every week. If a tooth becomes loose, the spring should be removed and the tooth splinted until consolidation, before a new activation is possible.

#### Advantages of the ballista spring system

The importance of the system is in the new perspective of treating impacted teeth and in the advantage of this system over the other systems.

1. Most impacted teeth are in close proximity to the roots of the adjacent teeth. A simple straight traction between the impacted tooth and edgewise vestibular arch wire means the compression of the impacted tooth against the roots of the adjacent teeth with failure in the treatment. The attachment of an impacted tooth to a lingual arch by an elastic is inefficient because the distance is not sufficient to activate the elastic properly without disturbing the movement of the tongue.

The ballista spring system uses a spring which creates a vertical traction on the

impacted tooth towards the middle of the palate. By this, it separates the impacted tooth from the roots of the adjacent teeth. By modifying the vertical part of the spring, one can control the direction of the eruption of the impacted tooth. If the spring is inclined forward or backwards, it adds these components to the vertical traction. By lengthening the vertical part of the spring, it adds a force towards the midline of the palate, and by shortening it adds force towards the dental arch.

Once the ballista spring is attached to the hook, it becomes tangent to the oral mucosa and it does not disturb the patient.

2. The ballista spring is easily inserted and ligated, and it is independent from the other parts of the appliance. The spring provides a continuous force that is well controlled and easily modified. Usually, by changing two to three springs, one can obtain the complete marsupialization of the canine's crown in the oral cavity.

3. In general, treatments of impacted teeth are lengthy. Most systems require full banding at the beginning of the treatment with potential esthetic problems in adults. This system does not require any banding of the front teeth during the active marsupialization state. At a large stage, when the crown erupts completely, the anterior teeth and the canines are bonded or banded. This second stage involves the normal placement of the canine in the dental arch with proper torque.

4. The surgical procedure for the impacted tooth in this system is less traumatic in comparison to some other systems. The flap is very limited and can heal rapidly. There is minimal trauma to the impacted tooth or to the adjacent teeth during the operation. Large flaps osteotomy around the crown of the impacted tooth close to the adjacent roots, circumferential wires around the crown, perforation in the crown in order to pass ligature wires, and drilling of holes to attach screws, golden chains, or other similar devices can be avoided.

5. The palatal impaction of the canine is the most frequent problem and was chosen for the description of the system. The ballista spring can also be used to retract impacted upper incisors, impacted upper and lower vestibular canines, impacted premolars. In all these cases, the principle is the same, with small modification of the anchorage or the spring. Only the degree of imagination of the practitioner is a limit of the system. This system permits treatment in young patients

or in adults of badly impacted teeth which previously were considered nontreatable.

#### Discussion

The ectopic eruption and impaction of permanent maxillary canines are frequently encountered clinical problems. Several techniques have been proposed in the literature for the correction of this condition<sup>1,5</sup>. The "Ballista Spring" system developed by Harry Jacoby<sup>6</sup> has some advantage over the other system; these are follows<sup>7</sup>:

1. The Ballista spring system uses a spring which creates a vertical traction on the impacted tooth along its long axis thus separating the impacted tooth from the roots of the adjacent tooth.

2. The Ballista spring is easily inserted, ligated and is independent of other parts of the appliance.

3. In general most systems require full bonded arches at the beginning of the treatment while the Ballista spring does not require any bonding of anterior teeth till the crown of the impacted tooth erupts completely.

4. It can be used for buccally as well as palatally impacted canines.

#### Conclusion

An 016" Australian Wilcock (Special Plus) wire is used to prepare the Ballista spring.

The canine is surgically exposed and a Begg bracket is bonded to it. The Ballista spring is then engaged into the bracket. The patient is called after every 15 days for a check up. After a month, the 016" Ballista spring is replaced by a 018" Ballista spring to increase the force level as advocated<sup>6</sup>. The marsupialization of the canine is achieved in 2 months, in an edge to edge and mesiolingually rotated position. Further alignment and finishing is performed by conventional Begg mechanics. So finally impacted canines shines in the arch with Ballista Spring.

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