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RESEARCH ARTICLE

MANAGEMENT OF PALATALLY IMPACTED CANINE USING BALLISTA SPRING: A CASE REPORT

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Abstract

Maxillary canine impaction is a commonly seen condition which is always challenging to the orthodontist to bring the tooth to the normal position and finish the case with proper canine class-I relationship. The “ballista spring system” has some advantages over the previously proposed systems described by different technique by different authors. Since the upper canines are the most frequently impacted teeth with which orthodontists are concerned, the purpose of this article is to describe and discuss a relatively technical approach to the orthodontic extrusion of impacted canine teeth using ballista spring.

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Introduction:-

Impacted teeth are a common finding in patients seen in orthodontic practice. After third molars, maxillary canines are among the most frequent teeth to be impacted.¹

Maxillary canine impaction is more common in females than in males with an incidence of palatal impaction of around 85% than labial impaction 15%.²

Studies have shown that there is no significant relationship between lack of arch space and palatally impacted canine (Peck 1994). In general, palatal displacement occurs regardless of dental arch space.³

Two most commonly used methods for exposing impacted canine are: (1) surgical exposure, allowing natural eruption, and (2) surgical exposure, with placement of an auxiliary attachment.²

Case Report:-

An 18 year old female reported with a chief complaint of irregularly placed upper and lower front teeth. Diagnostic records including the case history, clinical examination, lateral cephalogram, OPG, study models and intraoral and extraoral photographs, along with CBCT of second quadrant were taken.

On extraoral examination, she had a mildly convex profile, leptoprosopic facial form, competent lips and normal nasolabial angle (Fig. 1 (a), (b) and (c)). On intraoral examination, she had Class I molar relation bilaterally,

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crossbite with respect to right upper and lower central incisors, 100% deep overbite, retained left upper deciduous canine, crowding in upper and lower anterior region, and a palatal bulge could be palpated in the rugae area of the second quadrant (Fig. 2 (a), (b), (c), (d) and (e)).

OPG revealed impacted permanent upper left canine in Sector IV according to Ericson and Kurol⁴ and at an angulation of 51° to the midline (Fig. 3).

A fixed mechanotherapy treatment with a single lower incisor extraction was planned for the case. Anchorage preparation included a soldered transpalatal arch on the upper first molars. Leveling and alignment and crossbite correction was done by raising the bite and using 0.012" NiTi, followed by 0.014" NiTi, 0.016" NiTi, 0.016x0.022" NiTi and 0.016x0.022" SS wire. The upper left deciduous canine was left in place and an open coil spring was used between the brackets of left upper lateral incisor and first premolar (Fig. 4).

The left upper deciduous canine was extracted and the impacted canine was surgically exposed, an attachment was bonded to it and ligature wire was tied to the attachment to provide distal traction to the canine, and the flap was sutured back (Fig. 5 (a) and (b)). The lower right lateral incisor was also extracted.

However, the attachment got debonded after 1 month of traction. The canine was again exposed using electrocautery (Fig. 6) and a Beggs bracket was bonded to it. A ballista spring made of 0.014" Australian wire was made for the impacted canine (Fig. 7 (a) and (b)) and the vertical eruption of the canine was achieved within 3 months (Fig. 8). This was followed by the use of an 0.012" Piggyback NiTi wire on the impacted canine (Fig. 9).

Class I molar relation was maintained bilaterally along with Class I canine relation on right side and Class I canine relation was achieved on the left side (Fig. 10 (a), (b), (c) and (d)).



Fig 1:- (a), (b) and (c).





Fig 2:- (a), (b), (c), (d) and (e).



Fig 3:-



Fig 4:-

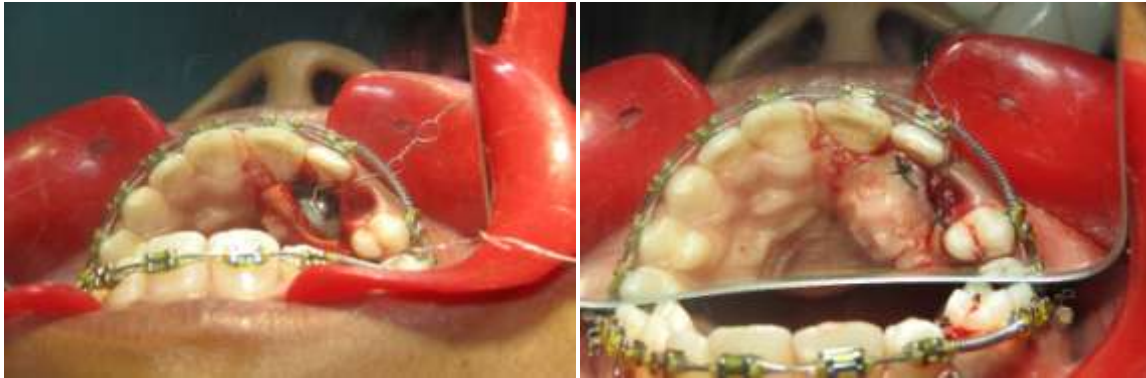


Fig 5:- (a) and (b).



Fig 6:-



Fig 7:- (a) and (b).



Fig 8:-

**Fig 9:-****Fig 10:-** (a), (b), (c) and (d).**Discussion:-**

Impacted canines can be assessed at the age of 9–10 years when the canine begins its long intrabony movement toward its functional position in the dental arch.⁵

If left untreated, a canine impaction may lead to migration of the neighboring teeth and loss of arch length, internal resorption, dentigerous cyst formation, external root resorption of the impacted tooth as well as the neighboring teeth, infection, particularly with partial eruption and referred pain. The most common sequelae are, root resorption of adjacent teeth, usually the incisors.⁶

The most common treatment options for an impacted maxillary canine are surgical exposure and orthodontic alignment or surgical removal. Surgical removal is indicated in patients with poor general dental status, without motivation toward orthodontic treatment, and in situations where the radiographic and soft tissue factors affect the prognosis of orthodontic alignment. Surgical removal is followed by prosthetic replacement of the canine if adequate space is present in the arch.⁶

Labially positioned canines have a poor prognosis due to the difficulty in managing the attached gingival width with a labial gingival flap access compared to the palatal flaps, where fenestration of the mucosa is less critical.⁶

Our patient had a palatally impacted canine and two basic surgical techniques are used to expose a palatal impaction closed eruption or an open window eruption technique. In the closed eruption technique the crown is surgically exposed, an attachment is bonded during the exposure and the flap is sutured back leaving a twisted ligature wire passing through the mucosa to apply orthodontic traction. In the open window eruption technique a flap is raised, the bone covering the crown of the impacted tooth is removed, a small window or fenestration is made, and the flap is sutured into place. The orthodontic attachment is bonded on the same appointment, the wound is packed with a surgical dressing for one week, and the bonding is done later, after removal of the pack.⁶

We used the closed eruption technique as Wisthet al⁷ suggested that a closed surgical exposure of a palatally displaced canine (PDC) leads to better periodontal outcomes than an open surgical exposure. A systematic review by Parkinet al⁸ found no evidence of the superiority in terms of clinical attachment levels after treatment with one technique over the other.

The disadvantage of closed eruption is that during bonding of the impacted canine at the time of surgery, it may cause soft tissue injury from the acid etched in an open wound. Moreover, maintaining a dry field is difficult for successful bonding, especially when the impaction is deep. In addition, the eruption of the impacted tooth may be delayed because of resistance of the thick keratinized mucosa.⁶

Several methods can be used for applying traction to the impacted canine which includes, elastic traction, lasso wires, and Kilroy spring designed by Bowman and Carano for guiding the eruption of permanent canine, K- 9 spring for alignment of impacted canine by Kalra, eruption of impacted canine with an Australian helical archwire by Christine Hausen, active palatal arch by Becker, etc., Ballista spring designed by Jacoby. These springs exert a light continuous force from being twisted on its long axis.⁹

We initially used a twisted ligature wire to provide a distal traction to the canine and guide the canine away from the roots of the incisors. This was followed by the use of the ballista spring, which was introduced by Jacoby¹⁰ in 1979. It was made of 0.014", 0.016" or 0.018" round wire, which accumulated its energy by being twisted on its long axis. It is a simplified orthodontic system for managing impacted teeth. The impacted canine is retracted by a spring that delivers a continuous force on its long axis. The force exerted on the tooth is vertical, without compressing the impacted tooth toward the adjacent roots. This force is well controlled and easily modified. Hence we were able to bring the impacted canine into Class I occlusion using the ballista spring followed by piggyback round NiTi wires.

Conclusion:-

Various surgical and orthodontic techniques may be used to recover impacted maxillary canines. The proper management of these teeth, however, requires the appropriate surgical technique to apply forces in a favorable direction and to have complete control for efficient correction, thereby avoiding damage to the adjacent teeth. The management of an impacted canine is a complex procedure requiring a multidisciplinary approach. Ballista spring has been used successfully in the present case and adequate attached gingiva has been preserved around the disimpacted canine. Hence, the ballista spring can be easily used and an impacted maxillary canine can be treated within 3-4 months with great results.

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