The Ectopic Maxillary Canine: An orthodontist prospective

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Abstract: This article reviews the various complications, etiology, biomechanics and management of the ectopic maxillary canine during orthodontic treatment. Much controversy surrounds the causes of canine palatal ectopia. Tooth eruption involves the migration of the teeth from a nonfunctional position within the bone to a functional position in the jaw. In orthodontic practice, it is inevitable that one will encounter eruptive abnormalities such as impacted, ectopically erupting, transposed, congenitally missing, and supernumerary teeth. The treatment plans were developed to address these anomalies and soft tissue reactions to the movements are considered. The management options are detailed with mechanics and the indications for each treatment modality based on the available scientific evidence are presented. Finally, the untoward sequelae of canine ectopia are discussed.

Key words: Ectopic Canine, orthodontics, mechanics

Introduction:

Orthodontics is considered to be a complex problem solving domain¹. A good example is this large number of patient factors and treatment variables which must be considered when dealing with maxillary ectopic canine. The complexity of this clinical problem is further compounded by the scarcity of properly controlled clinical research. Ectopic eruption can be broadly defined as the emergence/eruption of a tooth in a site different from its normal location, including all three planes of space: vertical, horizontal, and anteroposterior. Tooth transposition, is a special type of ectopic eruption.

Normal Development and Eruption Pattern

Broadbent stated that calcification of the permanent maxillary canine crown starts at 1 year old, between the roots of the first primary molar, and is complete at 5–6 years. By the age of 12 months the crown of the tooth is found between the roots of the first primary molar. At 3–4 years of age the canine passes over the line of the primary incisors to lie on the labial side of the root of the lateral incisor. At age 4 years the
primary first molar, the first premolar germ and the canine lie in vertical row. Subsequent growth on the facial surface of the maxilla provides space for the forward movement of the canine so suggested that a possible explanation for canine impaction to be excessive space in the canine area. Others suggested that causes of palatal impaction are trauma to the maxillary anterior region at an early stage of development.

Localization of the Maxillary Canine

Localization of the unerupted canine involves inspection, palpation, and radiographic assessment. The position of the crown of the lateral incisor can give a clue as to the position of the crown of the unerupted canine. For example, if canine is lying on the labial aspect of the lateral root the crown may be proclined. Often the crown of the unerupted canine can be palpated either in a buccal position or in a palatal position. Clinicians should become suspicious of the possibility of canine ectopia if the canine is not palpable in the buccal sulcus by the age of 10–11 years or if palpation indicates an asymmetrical eruption pattern. Inspection and palpation in the canine region is recommended annually from age 8 years.

Various methods such as Intraoral periapical radiographs, occlusal radiographs and orthopantamogram (Fig 1) can be used to diagnose. A new development is the use of magnetic resonance imaging (MRI) and scanoratomography in the localization of the canine.

Fig.1 – Ectopic eruption of maxillary canines seen in orthopantamogram

Biomechanics

Light forces of the magnitude of 20–60 g should be applied to align the canine. Various methods have been described for aligning the canine and these are described in detail by Hunter and Kokich and Matthews. These usually include the use of fixed appliances with a transpalatal bar and/or headgear to control vertical anchorage. The provision and maintenance of adequate space in the canine area is essential. Application of force can be in the form of elastic or wire traction. The use of the Ballista spring (a wire loop constructed of 0·012-inch stainless steel wire) has been
described by Jacoby (1979). Roberts-Harry and Harradine described the use of a sectional approach to maxillary canines using a transpalatal arch for anchorage. They use a 0·017- by 0·025-inch TMA sectional archwire from the first molar to canine providing a low force over a long range, which is controllable and remains stable in the 0·022-inch slot. Bennett and McLaughlin describe the use of a wound on auxiliary first vertical movement and then lateral movement. It is constructed of 0·014-inch steel wound on to 0·019- by 0·025-inch stainless steel. Orton et al describe the use of a versus the closed technique, and found that the apically lower removable appliance with soldered hooks on the cribs. The vector of force used to align the canine can be changed to first move the canine away from the incisor roots and then vertically and buccally. Fixed appliances are used to finish the alignment and create adequate buccal root torque and overlap. Magnetic forces have been advocated by some authors to apply force to the ectopic canine for alignment10,11.

**Treatment Planning Considerations**

The ectopic maxillary canine can often require complex multidisciplinary treatment involving oral surgical, restorative, periodontic, as well as orthodontic components8.

**Management Options**

The patient with an impacted maxillary canine initially must undergo a comprehensive assessment of the malocclusion to localize the canine and decide on its prognosis for alignment. Factors affecting the prognosis include patient co-operation, age, general oral health, skeletal variation, and presence of spacing or crowding in the arch12. Other conditions to be taken into account are the position of the canine in the three planes of space and whether any resorption of the incisor roots has taken place. It is important that the specialist be vigilant with respect to the malposition of the maxillary canine especially during its development and be conversant with the normal eruption pattern. Interceptive measures, when appropriate, are most advantageous in terms of cost benefit than other more invasive procedures. Patient and parent counselling on the treatment options and informed consent is essential to avoid any medicolegal problems.

The treatment alternatives include:

- Interceptive treatment.
- Surgical exposure and orthodontic alignment.
- Other options.

**Palatal Ectopic Canines**

Essentially, there are three methods for exposure and alignment of the canine12.
• Open surgical exposure and spontaneous eruption.
• Open surgical exposure and packing with subsequent bonding of an auxiliary.
• Closed surgical exposure and bonding of attachment intra-operatively.

**Buccally Ectopic Canines**

Buccal/labial impaction is much less frequent than palatal impaction occurring in only 15 per cent of cases. When a buccally ectopic canine is exposed it is essential that a closed technique or an apically repositioned be used to preserve the attached gingivae. The use of the apically repositioned flap versus the closed technique, and found that the apically repositioned flap resulted in more unaesthetic sequelae than the closed technique in maxillary anterior teeth.

**Retention Considerations**

Becker *et al* evaluated post-treatment alignment cases whose treatment was completed. They found spacing and rotations in 17.8 per cent of impacted canines and only in 8.7 per cent on the control side. Woloshyn *et al* found in a sample of previously exposed palatally impacted canines approximately 40 per cent displayed noticeable relapse and were judged to be intruded, linguually displaced, mesially rotated an average of 3 years and 7 months post-treatment. The contralateral untreated sides were found to be 91 per cent normal in appearance.

Bennett and McLaughlin (1997) suggest the following to prevent relapse:

• Full correction of torque.
• Early correction of rotations.
• Circumferential supracrestal fibrotomy.
• Provision of a bonded retainer.

It would seem appropriate to recommend surgical exposure and orthodontic alignment when:

• The patient is willing to wear orthodontic appliances.
• The patient is well motivated and has good general dental health.
• Interceptive measures are inappropriate.
• The degree of malposition is not too great to preclude orthodontic alignment. The long axis of the ectopic canine should not be too horizontal or too oblique. The closer the crown is to the midline and the root is to the headgear to control vertical anchorage. The provision and mid-palatal suture the poorer the prognosis for alignment.
Surgical Removal of permanent canine:

Surgical removal of the tooth is indicated if there is poor patient co-operation or poor position for alignment (canine and it can be removed atraumatically in an oblique or horizontal position). Ideally, there should be a good lateral incisor/first premolar contact. In cases where the patient is willing to undergo comprehensive treatment, it is possible to use the first premolar as a rotation and the introduction of buccal root torque. Grinding of the premolar palatal cusp is also necessary. Other factors to consider include tooth size discrepancy and the difficulties in handling unilateral mechanics. In a case where the primary canine is left following extraction of the permanent successor it is not possible to tell how long the primary canine will remain intact. Little longitudinal research has been carried out on this aspect of canine ectopia. In the event of the primary canine becoming unsightly or being lost it could be extracted and replaced by a prosthodontic restoration whether fixed, removable, or osseointegrated implant.

The surgical removal of ectopic canines is recommended when:

- Patient declines active treatment and/or is happy with appearance.
- There is evidence of early resorption of adjacent teeth.
- The patient is too old for interception.
- There is a good contact between the lateral incisor and 1st premolar or the patient is willing to undergo orthodontic treatment to substitute first premolar for the canine.
- The degree of malposition is too great for surgical repositioning/transplantation.

Sequelae of Canine Ectopia:

Internal or external root resorption of teeth adjacent to the ectopic canine is the most common sequela. It has been estimated that 0.7 per cent of children in the 10–13-year-old age group have permanent incisors resorbed, as a result of canine ectopia. Root resorption can be expected in about 12.5 per cent of the incisors adjacent to ectopic maxillary canines. Resorption of the lateral incisor is more common than the central incisor. Rarely the first premolar is resorbed. A number of studies have found that females are more likely to be affected. If the canine has migrated to a position medial to the mid-root of the lateral incisor, the resorption is more likely. In addition, if the angulation of the long axis of the canine to the midline on an orthopantomogram exceeds 25 degrees the risk increases by 50 per cent. Lateral incisors are more commonly resorbed palatally and at the mid root level than at the appearance cervical or apical regions. There appears to be no association between enlarged follicles surrounding the canine and the potential for resorption.

Conclusion:
The orthodontist needs to carefully evaluate developing dentitions for eruptive anomalies during screening procedures as these problems of eruption can be identified early and preventive as well as interceptive or active orthodontics can be instituted with various techniques as early as possible.

References:


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