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Orthodontic management of the ectopic erupted maxillary canine

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Abstract:

Introduction: Ectopic maxillary canine teeth, displaced from their actual position. The reason may be genetic and environmental. Orthodontic treatment is recommended as the ectopic canine teeth can migrate and damage the roots of adjacent teeth, further aesthetic reasons are a clear indication for treatment. Severe upper and lower anterior crowding is another problem seen in this case. This article reports a case of a buccally displaced maxillary canine and a retained deciduous maxillary canine, treated with non-extraction using segmental mechanics with T-loop fabricated with 0.017x0.025" TMA wire and distalization of the upper left molar to align blocked out upper left canine.

Keywords : Ectopic Erupted canine, Orthodontic management, loop mechanics, buccally placed canine, mini screw.

Introduction:-

Ectopic buccally erupted maxillary canines are one of the most frequently encountered conditions in orthodontic practice. The prevalence of permanent maxillary canine impaction or ectopic eruption in the general population is approximately 1–2%.[1,2].

Palatally displaced canines occur twice as frequently as buccally.[3] However, buccally displaced canines are commonly seen in practice. When dentitions with Palatally displaced canine, erupted and unerupted, are compared with dentitions with Buccally displaced canines, erupted and unerupted, the main difference between these two conditions is an altered tooth size–arch length relationship.

Aetiology:

There are two theories on the canines that are palatally impacted. One is the *genetic theory*, the cause is thought to be polygenic. There is a high rate of incidence of ectopic canines with dental anomalies such as pegged lateral incisors, missing lateral incisors, delayed eruption, and the absence of crowding.[4]

A second theory is the *guidance theory*, states that the root of the lateral incisor will guide the eruption of the canine into the arch. Hence, even if the lateral incisor is diminutive or missing because of genetics, local environmental factors ultimately result in the eruption of the canine in an abnormal position.[5]

Epidemiology

Canines are the 2nd most commonly impacted tooth after third molars, with a prevalence of 1.5% in the population. [6] Impactions occur twice as frequently in females (1.17%) as in males (0.51%). Approximately 8% of impaction cases are bilateral (affecting both permanent canines).[7]

Signs and symptoms :

- Delayed eruption of permanent canine[8]
- Erupted contralateral permanent canine
- Retained deciduous canine[9]
- Unable to clinically palpate permanent canine

- Loss of vitality and increased mobility of the lateral and/or central incisors
- Discolouration of upper incisors
- Distal tipping of lateral incisors
- Diminutive lateral incisor[10]

Diagnosis:

Clinically:

In normal development, canines are typically palpable in the buccal sulcus by ages 10–11.[11] If a primary canine is retained beyond the age of 12 to 13 years, with no signs of mobility and no labial canine bulge, impaction of the permanent canine should be suspected. A radiograph should be taken to confirm the diagnosis.[12]

Radiographically:

However, there is limited use in taking a radiograph before the age of 10-11. To locate the position of the permanent canine the most commonly used technique is the parallax technique. The parallax technique is done by taking two radiographs in different positions. There could be either a vertical shift or a horizontal shift between the two radiographs. A vertical shift might be done by taking a periapical and an upper anterior occlusal, while a horizontal shift might be done by taking two periapical with significant horizontal tube shift. An image shift principle is then applied to the two radiographs taken. A useful acronym is the 'SLOB' rule, which stands for "same lingual opposite buccal". This means that when looking at the radiographs from e.g. left to the right direction, if the canine has moved in the same direction, then following the "same lingual" part of the rule, the canine is positioned lingually. There is a low evidence base for choosing either preferentially. However, one study suggests that using a horizontal parallax is more accurate than a vertical parallax in locating ectopic canines. [13]

An alternative method is the use of CBCT (small field of view). These can also be used to localise ectopic canines three-dimensionally.

Case report:

Diagnosis and aetiology:

A 23-year-old female patient came to the department with the chief complaint of irregularly placed teeth in the upper and lower anterior. Clinical and radiographic examination reveals convex profile with vertical growth pattern, Dolichocephalic, Leptoprosopic facial form, convex profile, with average nasolabial angle and competent .{fig 1}

Fig 1 : pre-treatment extraoral photographs

Angles class I molar relation and canine relationship cannot be assessed due to ectopic erupted canine on the upper right and crossbite on the upper left side, rotations irt 15,24,25,34,35,44,45 with an overjet of 2 mm and overbite of 3 mm and crossbite irt 23-33, lower midline deviated to the right side by 1mm. {fig 2 }.

Fig 2 : pre-treatment intraoral photographs

The panoramic radiograph showed no pathologies. The maxillary third molars were developed.{fig 3}.

Fig 3 : pre-treatment OPG

The lateral cephalometric analysis revealed the patient had a Class I skeletal base with vertical growth pattern.

(ANB: 3°, Wits: 2 mm) with a hyperdivergent growth pattern (SN-MP: 35°). The patient's maxillary incisors were proclined (U1-SN: 106°) and the mandibular incisors were slightly proclined (IMPA: 95°) {fig 4}.

Fig 4 : pre-treatment Lateral cephalogram

Treatment objectives :

The treatment objectives were to correct the ectopic position of the maxillary canine, to extract the retained tooth, To correct proclined and protruded lower incisors, To correct rotations and crowding in the lower arch, To correct a crossbite, To maintain the corrections achieved.

Treatment plan :

Based on the diagnosis, a treatment plan was decided to correct the ectopic position of the maxillary canine through non-extraction treatment was selected. The extraction of deciduous tooth followed by distal movement of ectopic erupted canine and molar distalization on the left side to correct blocked out canine on the left side(23)

Treatment progress:

Bonding of upper & lower arch with MBT 0.22 slot and Banding was done on 16,17, 26, 27, 36, 37, 46, 47. and 0.014″ Ni-Ti wire placed in the upper and lower arch. Followed by 0.016″ SS wire is placed in upper arch & 0.016” Ni-Ti wire in a lower arch placed, then 0.016x 0.022” SS wire is placed in upper arch bypassing the canine 13 and lateral 22 and 0.016 X 0.022” Ni-Ti wire is placed in the lower arch. 0.017x 0.025" SS in the upper arch and 0.017 X 0.025" Ni-Ti in the lower arch, followed by placing of 0.019x 0.025" SS in the upper arch and 0.019 X 0.025" Ni-Ti in the lower arch, then Segmental 0.019x 0.025" SS in the upper arch and 0.019x 0.025" SS in the lower arch, followed by placing of segmental 0.019x 0.025” SS wire in the upper arch and T- Loop fabricated and activation irt 13 to move the ectopic erupted canine distally. {fig 5}.

Fig 5 : T-loop insertion and activation

The patient was referred to oral surgical department for extraction of upper left third molar (28). Mini screw was placed in between 25,26 for distalization of the upper left molar to align the blocked out upper left canine 23 {fig 6}.

Fig 6 : Mini Screw placed for distalization

Followed by placing of 0.018" SS wire with an Open coil spring placed irt 25,26, distalization of 6mm was achieved. {Fig 7}.

Fig 7 : 6mm of distalization achieved

Then Posterior bite plate placed in lower arch upper beg bracket placed irt 23 and buccal traction was given to align upper left canine into the arch. A continues 0.014" Ni-Ti wire placed in the upper arch, after that a 0.019 x 0.025" Ni-Ti wire placed in the upper arch. After a month we have placed 0.019 x 0.025" SS wire in the upper arch, and followed by class II elastic given on right and left side to align minor discrepancy. Settling elastics given on right and left side. Total treatment duration was 24 months.

Treatment results:

Post-treatment records revealed that treatment objectives were achieved. Facial photographs showed an improved profile {fig 8}.

Fig 8 : post-treatment extraoral photographs

Class I canine relationships were established with canine-protected occlusion. Crowding of the maxillary and the mandibular arch was corrected. Dental midlines were aligned with the facial midline, and ideal overbite and overjet were achieved {fig 9}.

Fig 9 : post-treatment intraoral photographs

DISCUSSION:

Repositioning an ectopic erupted tooth commonly involves a combination of surgical, periodontal, and orthodontic challenges. Moreover, a variety of orthodontic technique has been well-documented. The segmented T-loop applied, in this case, displayed some advantages.[14] Principal benefit of this segmented arch was control of three-dimensional tooth movement (vertically, anteroposteriorly, buccolingually) merely by adjusting different parts of the segment. During the commencement of retraction of the ectopic erupted canine, the segmented T-loop served as a retraction spring, which offered not only a distal traction force on the canine with active tying back. As the retraction progressed, the ectopic tooth was separated from the root of the adjacent lateral incisor and gradually moved distally toward the proper anteroposterior position while the canine still kept its axial inclination. At the late stage of repositioning, a vertical component of force operating on the canine became more desirable. When the segmented arch was adjusted to exert an extrusive force to bring the canine toward the occlusion, the same as the mechanism of a cantilevered arch, a reciprocal intrusive force on the molar was also anticipated. Previous to employing the retraction and extrusion force on the canine, the posterior teeth were aligned and stabilized with a .019 x .025 stainless steel continuous wire in addition to the transpalatal arch for anchorage reinforcement. Unlike continuous archwire. in which actions and reactions may occur between adjacent teeth. Segmental principles can be used to diminish the undesirable side effects produced on adjacent brackets because it is independent of other parts of the appliances. An additional advantage of the spring is that it provides a relatively continuous force which is well controlled and easily modified.[15]

Conclusion:

It is desirable to maintain a constant force level during tooth movement, and this is achieved by designing springs with low-deflection characteristics. T.M.A has excellent spring-back properties with good formability. The ectopic tooth is retracted by a segmented T-loop spring made with T.M.A that accumulates a continuous force from being active tied back and received an anti-distal tipping moment by tip forward bend on the mesial horizontal leg of the T-loop. An additional principal benefit we appreciated is that the force system is predictable since we are basically dealing with frictionless springs and are not dependent upon sliding teeth along an archwire for control.

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