Surgical and Orthodontic Management of the Ectopic, Labially Impacted, Maxillary Canines: A Case Series

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Maxillary canines are the second most commonly impacted teeth. Two thirds of these impacted canines are palatal, and one third are labially impacted. Maxillary labial impactions comprise approximately 0.33% to 0.75% of the general population. Like palatal impactions, preventive and interceptive methods can be employed to help the impacted tooth erupt and avoid surgical uncovering. Early extraction of appropriate primary teeth and palatal expansion has helped some of these impactions erupt spontaneously. Most labially impacted canines are positioned “in the slot,” in a midalveolar location between the lateral incisor and first premolar. If they do not erupt after preventive or interceptive means, they can be managed with simple closed-eruption uncovering techniques. The most difficult labial impactions are ectopically positioned. These are usually horizontally positioned, mesial to the lateral incisor. They can be very apically positioned, near the base of the nose and near the midline. The rarest labial impaction occurs between the central and lateral incisors or between the premolars. These are extremely rare and require special orthodontic and uncovering techniques. All of these ectopic impactions require a technique that leaves the impacted tooth uncovered so the orthodontist can employ the proper mechanics to move these teeth without damage to adjacent structures. This article elucidates the surgical uncovering techniques and the orthodontic mechanics to successfully move these teeth and minimize root resorption, bone loss, and recession. Int J Periodontics Restorative Dent 2022;42:713–720. doi: 10.11607/prd.6255

The etiology of maxillary canine impaction is multifactorial.1–5 Early diagnosis is extremely important in managing impacted canines. Today, the use of CBCT is extremely helpful in diagnosing the exact location of the impacted tooth and provides a clearer image of any areas of root resorption. Because CBCT was not available at the time the present cases were treated, diagnostes were made with two periapical radiographs taken from different angles and using the buccal object rule to confirm labial impaction.6,7 There are other subtle factors that can aid in making the correct diagnosis, such as a labial bulge in the mucosa and labially tipped lateral incisors.

Preventive and interceptive methods, such as early extraction of the deciduous canine and arch expansion, have been shown to be effective in avoiding these types of impactions.8–10 Most importantly, early diagnosis can minimize the resorption and bone loss to adjacent teeth when the canine erupts aberrantly (Fig 1).11–16 Unlike palatally impacted canines, which can spontaneously erupt up to 10 mm after uncovering, labially impacted, ectopically positioned maxillary canines need considerable time and thoughtful orthodontic mechanics to move them into an ideal occlusion. There is a greater likelihood of

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Materials and Methods

The employed surgical technique must leave the tooth uncovered to allow the orthodontist access for the appropriate mechanics to “jump” it over adjacent roots. The surgeon deals with varying amounts of attached gingiva depending on the location of the impacted tooth in relation to the mucogingival junction (MGJ). Most of these impactions are near or apical to the MGJ and require an apically positioned flap (APF) to uncover them and ensure an adequate band of attached gingiva during orthodontic treatment. In addition, all of the present cases were more complex because the impacted teeth were successfully positioned with ideal anterior esthetics. Note the lack of recession on the central and lateral incisors and canine due to the judicious uncovering and skillful orthodontics. The posttreatment radiograph shows no further root resorption of the previously resorbed maxillary incisor roots.
deeply embedded and completely covered with bone, so flap uncovering for access and careful bone removal were imperative.

The design of the APF is important: It must include 2 to 3 mm of gingiva without exposing an underlying dehiscence on the donor tooth. For this reason, the donor site should be evaluated via bone sounding to be sure there is adequate bone over the donor tooth to avoid recession. If there is not adequate bone, then a split-thickness APF should be employed. A free gingival graft or a connective tissue graft can be placed over the periosteum to ensure that no recession occurs. All of the present cases were covered with a thin shell of bone that could be easily removed with a curette. The periphery of the surgical site can be widened with judicious bone removal, using Piezosurgery instrumentation or burs to expose the tooth. An area slightly wider than the periphery of the crown is made. The sac is not disturbed, and the cementoenamel junction (CEJ) is not exposed. The flap is sutured to the periosteum (apical to the tooth) and secured with resorbable sutures. A cleat (a bracket with a semicircular attachment) is bonded to the tooth to retain the light-cured Barricaid dressing (Dentsply).22

It has been found that some of these ectopic, horizontally impacted canines will erupt spontaneously and slightly correct their alignment. For this reason, they can be uncovered early (like the palatally impacted canines), prior to placement of orthodontic appliances. If this is done, it is imperative that a dressing is placed and retained long enough to complete healing so the impacted tooth does not recover.

Cases

Case 1

A 13-year-old girl presented with an ectopic, horizontally impacted canine at the base of the nose, near the midline (Fig 1a). The impacted tooth was causing apical root resorption of the left central and lateral incisors. The central incisor had 5 mm of gingiva, and it was evaluated via bone sounding. A normal bone level was present, allowing an APF with 2 mm of gingiva to be reflected, leaving 3 mm of gingiva over the central incisor. Vertical incisions were made, and a full-thickness flap was reflected (Fig 1b). Because the impacted tooth was completely covered with bone, burs and curettes were used to uncover the crown of the tooth. A cleat was bonded to the impacted tooth, and the APF was sutured apically, exposing the tooth (Fig 1c). A light-cured dressing (Barricaid) was placed over the tooth to keep it exposed for the following 6 weeks.

Orthodontic treatment was initiated using a labial bow that was custom-made from a facebow. An auxiliary spring was soldered to the bow to put extrusive labial and distal forces on the canine to “jump” it over the lateral incisor root (Fig 1d). Orthodontic treatment was completed 6 months later. Adequate gingiva was present, without recession over the central or lateral incisors or canine (Fig 1e). The post-treatment panoramic radiograph showed no further root resorption of the incisors (Fig 1f).

Case 2

An adolescent girl presented with a deeply embedded labially impacted canine that was causing root resorption on the right lateral incisor. The tooth was embedded so deeply that it appeared to be palatally positioned when the buccal object rule was used to evaluate the periapical radiographs (Fig 2a). Other signs, such as the labial bulge in the vestibule and the tipping of the lateral incisor, gave additional information to confirm the labial position of the tooth (Fig 2b). The impacted canine was uncovered with an APF, using the central and lateral incisors for the donor flap. The tooth was completely covered with bone, so judicious bone removal was accomplished using burs and curettes (Fig 2c). The canine crown was exposed, and a cleat and chain were bonded to the labial surface (Fig 2d). The flap was sutured apically to the periosteum with resorbable sutures, leaving the crown exposed. A Barricaid dressing was placed to keep the tooth uncovered.

Eight weeks later, tooth movement was initiated using a labially directed extrusive force with a Ballista spring. Once the canine was “jumped” over the lateral incisor, orthodontic finishing and appropriate root torque could be completed. This phase of orthodontic treatment took approximately...
Case 3

A 12-year-old girl had an impacted canine that was transposed between the right central and lateral incisors, and it had caused significant root resorption on the central incisor (Fig 3a). Uncovering with an APF was planned over the central and lateral incisors, which had 4 mm of gingiva. Both teeth were evaluated via bone sounding and had normal bone levels near the CEJ. An APF with vertical incisions was reflected, preserving 2 mm of gingiva over the donor teeth. The canine was completely covered with bone, so judicious bone removal was necessary to uncover it (Fig 3b). The flap was sutured apically to the periosteum, and a cleat was bonded to the canine (Fig 3c). A Barricaid dressing was placed to keep the tooth uncovered for 8 weeks. The patient was referred back to the orthodontist to begin tooth movement.

The orthodontist used a modified removable headgear bow (0.036 mm) that fit into the tubes of the maxillary first molar bands. An auxiliary spring was soldered to the bow so that an elastic could be attached from the spring to the impacted canine, allowing it to move straight (labially) to “jump” it over the lateral incisor (Fig 3d). Additionally, a transpalatal archwire with an attached spring was used to deliver a lingual force to move the lateral incisor palatally, aiding the lateral movement of the impacted canine. Six months later, the canine was in an ideal position. In spite of the preexisting
advanced root resorption, at the 5-year follow-up, no further root resorption was seen, the tooth position was stable, and healthy attachment levels were seen around the central and lateral incisors and canine (Figs 3e and 3f).

Case 4

The maxillary left canine was ectopically impacted and laying over the root of the lateral incisor (Fig 4a). Using the buccal object rule, it was evident that the canine was labially impacted; labial tipping of the lateral incisor and a slight labial bulge were further evidence of the canine’s labial position (Fig 4b). A horizontal incision (without vertical incisions) was made from the central incisor to the premolar, preserving 2 mm of gingiva with the flap. The flap was draped apically, bone was removed to uncover the canine, and the flap was sutured apically with resorbable sutures. Cotton pledgets were placed around the periphery of the exposed crown to minimize bleeding, facilitating the bonding process (Fig 4c). A cleat was bonded to the tooth, and a Barricaid dressing was placed to keep the tooth uncovered. The dressing was removed after 4 weeks. Four months later, the tooth had spontaneously erupted approximately 3 mm (Fig 4d), and a 0.016-mm copper, nickel-titanium alloy, heat-treated wire was placed to begin alignment. Five months later, a stiff 0.019 × 0.025-mm wire was used to move the canine into an ideal position. A panoramic radiograph was taken to show the progress to ensure good alignment without further root resorption (Fig 4e). At the 6-year follow-up, good alignment and adequate gingiva were seen, and there was no recession on the central and lateral incisors or canine (Fig 4f).
Discussion

All of these cases illustrate the importance of early diagnosis so that preventive and interceptive treatments can be employed to minimize damage to adjacent teeth when an aberrant eruption pattern is first diagnosed. Once the tooth is in an ectopic location, judicious surgical uncovering and appropriate orthodontic mechanics will be necessary to position the tooth without damaging the impacted tooth and adjacent periodontal structures.23–25

CBCT was in its early stage of development when these impactions were treated, and thus the location of these impacted teeth was determined with two periapical radiographs taken at different angles. Today, CBCT can provide a clearer picture of the exact location of the impacted tooth in relation to adjacent structures, and it can better evaluate the amount of root resorption.26–28

All of the present labially impacted maxillary canines were ectopically located, totally covered with bone, and were apical to the MGJ. It is necessary to have adequate flap access to visualize the site for judicious bone removal. Preservation of gingiva with the flap is paramount in minimizing recession during the orthodontic phase of treatment. Leaving the tooth uncovered is imperative to allow the orthodontist access to apply appropriate mechanics to “jump” the tooth over the adjacent roots without damaging the adjacent structures. Trying to move these teeth with a “closed procedure” is fraught with a few problems: Resorption of adjacent structures can occur because of the improper force vector; teeth move through the bone because of the periodontal ligament, which physiologically resorbs bone as the tooth moves; and dragging the enamel against bone will not resorb the bone physiologically. Movement will occur very slowly, if at all.

The flap design is important for preserving gingiva to minimize

Fig 4. Case 4. (a) Two periapical radiographs taken from different angles show that the maxillary left canine was labially impacted and laying over the root of the lateral incisor. (b) A slight labial bulge can be seen in the vestibule above the left lateral incisor, which has been displaced labially and distally by the impacted canine. The deciduous canine is still present. (c) A long horizontal incision (without vertical incisions) was made from the central incisor to the first premolar. Bone was removed, uncovering the canine. A bracket was bonded, and a light-cured Barricaid dressing was placed to keep the tooth uncovered. The deciduous canine was extracted. (d) Four months later, the canine had autonomously erupted 4 mm. The patient was referred back to the orthodontist to begin treatment. (e) The radiographic view near the end of orthodontic treatment shows good alignment and no further root resorption. (f) The clinical view at the 6-year follow-up shows good tooth alignment, no relapse, and healthy, esthetic gingival levels on the central incisor, lateral incisor, and canine.
recession and enhance the long-term stability of orthodontic movement. Preserving the gingiva around the donor teeth and the flap will help minimize recession on the donor teeth and the impacted canine. A modification of the APF was designed by Janakievski and published. A long, horizontal incision is made (avoiding vertical incisions) so the flap can be draped apically, exposing the area of the impacted canine. This newer flap design has some advantages over the APF with vertical incisions: It may minimize intrusive relapse of the canine that is occasionally seen with the APF, and avoiding the vertical incision lines will improve gingival esthetics.

In Case 3, extraction of the central incisor and substituting the canine for the central incisor were considered. This would require restoration of the canine to make it appear like a central incisor, and the missing canine would need to be replaced with an implant. However, the shape of the canine was not ideal and would require extrusion and major modifications to make it appear like a central incisor. In addition, the canine site would have required bone augmentation prior to implant placement.

Cases 1 and 3 were late referrals to the orthodontist and had advanced root resorption on the impacted tooth and adjacent teeth prior to treatment. With skillful uncovering and orthodontic mechanics, the resorption did not worsen during treatment. Once the force is removed from the resorbing root, the resorption will stop. Unfortunately, many of these maxillary anterior teeth with advanced root resorption are deemed “hopeless” and are ultimately extracted. However, one study followed up on many teeth with advanced root resorption over an extended period of time, and the teeth achieved and maintained good conditions.

Conclusions

The importance of early diagnosis and employing preventive and interceptive methods can help avoid impaction of the ectopic labially positioned canine. Once the tooth becomes ectopically impacted, special surgical and orthodontic techniques will be necessary to position it in an ideal location without harm to adjacent structures.

The present case series elucidates the methods in which these teeth can be uncovered and moved into an ideal position without orthodontic relapse or damage to adjacent structures, preserving the periodontal health and esthetics around the previously impacted tooth and adjacent teeth.

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References


