ALIGNMENT OF A BUCCALLY DISPLACED MAXILLARY CANINE IN THE LATE MIXED DENTITION WITH A MODIFIED UTILITY ARCH: A PATIENT REPORT

Maxillary canines and first molars are the most common ectopic teeth in young people. Ectopic buccal eruption of maxillary canines is strongly associated with lack of space or crowding in the dental arch. This report demonstrates the management of a buccally erupted maxillary canine in an 11-year, 8-month-old boy without sufficient space. The patient had a mostly dental Class II occlusion and was in the late mixed dentition, and the root development of his canines was consistent with his dental age. To correct the distal occlusion and gain space in the maxillary arch for the eruption of both canines, the patient received cervical headgear. To guide the maxillary left canine into occlusion, it was surgically exposed and a modified utility arch inserted. The result of this approach proves that a custom-designed utility arch allows the distal movement of a buccally displaced canine, while at the same time increasing the maxillary arch length. World J Orthod 2010;11:185–190.

Key words: utility arch, buccally displaced maxillary canine, mixed dentition

Maxillary canines and first molars are the most frequent ectopic teeth in young patients.1–3 The prevalence of displaced canines ranges from 0.92% to 4.30%.4 General and local causes can affect canines during their long and complicated path of eruption, leading to retarded and ectopic eruption.5,6 Palatal displacement of maxillary canines7 seems genetic in origin, in contrast to buccal displacement, which is strongly associated with lack of space or crowding in the dental arch.8–10 In Europeans, palatal impaction of the maxillary canine is at least two to three times more frequent than labial impaction.7,11,12 Because the normal eruption path of a permanent canine is slightly buccal to the line of the arch, reduced space in the canine area, as well as the close proximity to the adjacent teeth, will prevent this tooth from taking its normal position in the arch so that it will remain buccally displaced.9

The most common treatment procedure in children and adolescents in such a situation is to gain space, to expose the canine surgically,13–15 and to align this tooth orthodontically. Alternatively, the displaced canine can be extracted and reimplanted. Ultimately, it could be prosthetically replaced by an implant or fixed partial denture. Space closure is also possible.16–18 This patient report demonstrates the successful management of a buccally displaced maxillary permanent canine, which originally overlapped the lateral incisor and did not have enough space to be aligned in the dental arch. The main therapy adjunct was a modified utility arch according to the bioprogressive technique.19–21
PATIENT REPORT

Diagnosis

An Italian boy, 11 years 8 months of age, of Caucasian background was referred to the Graduate Orthodontic/Pedodontic Clinic of the School of Dentistry of the University of Catania for evaluation of his malocclusion. His chief complaint was impaired esthetics due an early loss of his primary maxillary canines (Fig 1).

His intraoral examination showed that he had a dental Class II relationship and was in the late mixed dentition. The dental midlines were nearly coincident with each other and the face, the patient had no mandibular shift, and there was a lack of space for the eruption of both canines.

The patient had a symmetric face. Cephalometrically, he showed a very mild skeletal Class II relationship and a slight decrease in lower facial height (Fig 2a). He had no signs or symptoms of a temporomandibular disorder, and his medical and dental histories were unremarkable.

His panoramic radiograph showed that all permanent teeth were present (Fig 2b). The root development of both the patient’s maxillary canines was consistent with his dental age. The crowns of both canines were near the apices of the lateral incisors.

According to the measurements proposed by Ericson and Kurol, 22 these two canines were in a position where the risk of lateral incisor root resorption during therapy was low (α angle < 25 degrees, cusps inside sector 3 were between the axis of the lateral incisor and the first premolar).
Other radiographic examinations for the localization of the maxillary canines were not undertaken because the mother was worried about exposing her child to too much radiation.

Treatment objectives

The objectives of the orthodontic treatment were to correct the mainly dental Class II malocclusion, to gain space in the maxillary arch to allow the eruption of both canines, and to level and align all teeth to obtain a bilateral Class I relationship without any interferences and a normal overjet and overbite.

Based on the patient’s overall soft tissue profile and cephalometric analysis, it was determined that a treatment without (premolar) extractions would be the best option.

To achieve these objectives, it was decided to (1) use a cervical headgear to restrain maxillary growth for the correction of the Class II occlusion and to gain space by moving his molars distally and to (2) place fixed appliances in both arches.

Treatment progress

After initial oral prophylaxis and topical fluoride application, the headgear was inserted. All bonds and bands had 0.018 × 0.025-inch slots and standard bioprogressive prescription. The headgear had a long outer bow adjusted so that the resultant force passed through the center of resistance of the first molars. The patient was instructed to wear his headgear 12 hours a day; he was seen every 2 weeks.

Three months after headgear application, the maxillary left permanent canine started to erupt in front of the left lateral incisor, but there was still not enough space to align this tooth. The three problems that had to be immediately addressed were to gain sufficient space, start the alignment of the displaced canine, and ensure periodontal integrity of the left lateral incisor and canine.

To accomplish these items, the canine was exposed in a single-step surgical procedure and a utility arch was inserted with the tooth’s immediate alignment. A full-thickness mucoperiosteal flap was raised, initially without vertical incisions (Fig 3a). Vertical releasing incisions were then placed mesially and distally, and an apically positioned flap was formed and sutured with silk thread. This flap ensured that adequate keratinized gingiva was maintained cervical to the canine crown.

The enamel of this tooth was etched with 37% phosphoric acid for 60 seconds and kept dry using suction and gauze. Then, a button with a ligation chain (TP Orthodontics) was bonded with light-curing resin cement (Unitek, Transbond XT; exposed at 470 nm for 40 seconds; Fig 3b).

Four days after the exposure, all maxillary incisors were bonded and an individualized utility arch inserted. This archwire was constructed with a helix on the left bridge to allow the ligation of the metallic chain to move the canine distally and slightly occlusally (Fig 3c). Moreover, all spaces between the incisors were closed with an elastic chain to gain more space; headgear wear was continued.
When the patient was seen about 2 weeks after surgery, the sutures were removed and the eruption situation, gingival tissue response, sulcus probing depth, and infection status assessed. Because the space condition was not yet satisfactory and the overjet was nearly 1 mm, a protraction utility arch was inserted.

Three months later, both canines were well-enough aligned to be rebonded, and leveling was continued with T-loops (Fig 4) until both canines were nearly in their final position (Fig 5). At this time, all remaining teeth in both arches were bonded with standard bioprogressive appliances with 0.018 × 0.025-inch slots; further treatment was uneventful and carried out with routine archwire sequence.

**DISCUSSION**

Of all maxillary teeth mesial to the first molar, the permanent canine is the final one to erupt. At this point, the permanent lateral incisor and first premolar have found their places in the dental arch. Thus, if space is missing, it is the canine that will usually be buccally displaced.23 Canines with an anomalous position could resorb the roots of adjacent teeth such as the lateral incisors.24,25 Recent studies have revealed that such resorptions are a relatively common phenomenon.26–28 Hence, Ericson and Kuro29 observed via intraoral radiographs supplemented with computed tomography that root resorptions occurred in 48% of their sample. Buccal eruptions do not cause more frequent resorptions than palatal ones; in both conditions, they amount to roughly 40%.
Early supervision of canine eruption is the best appraisal to prevent incisor root resorption. The most common treatment procedure in children and adolescents is a surgical-orthodontic approach, even though alternative treatments have been described.

According to Proffit and Fields, the three problems of a surgical-orthodontic approach in impacted teeth are surgical exposure, attachment integrity, and orthodontic alignment. Bishara advocates the surgical exposure of impacted canines with no subsequent orthodontic traction when their axial inclination is correct. However, such teeth rarely erupt once their root formation is complete.

For uncovering buccally impacted canines, oral surgeons can choose between two methods: an apically positioned flap or a repositioning of the flap after attachment fixation for a closed eruption. Using the apically positioned flap technique, Vanarsdall and Corn found no marginal bone loss or gingival recession. According to Vermette et al, labially impacted maxillary anterior teeth uncovered with an apically positioned flap are periodontally and esthetically more compromised than if a closed eruption is performed. If teeth are impacted high in the vestibule or on the middle of the alveolus, the closed-eruption approach may be preferable.

In the present case, root formation was nearly complete and the canine was erupting buccally of the lateral incisor. In accordance with Kokich and Mathews, an apically positioned flap was formed to ensure that a maximum amount of keratinized gingiva was maintained cervical to the crown.

Generally, headgear is used to move buccally displaced teeth distally to correct a Class II malocclusion and to gain space in the dental arch. In patients such as the one presented here, this is not sufficient and other approaches must be initiated. However, target-orientated arch expansion is sometimes difficult, especially in situations with reduced anchorage. Therefore, a custom utility arch was used to support the expansion. At first, this arch allowed a distal and occlusal movement of the canine and simultaneous closing of the anterior space to further increase arch length. After sufficient space was available, a protraction utility arch was used to gain the final space necessary to allow the alignment of the canine in the dental arch.

CONCLUSION

A custom maxillary utility arch can allow buccally displaced canines to move distally while at the same time increasing arch length. This kind of archwire is particularly useful when primary molars will soon exfoliate. The advantage of the methods applied in this case report resulted in improved function and esthetics with a full complement of teeth.

REFERENCES