

YOUNG ADULT PATIENT WITH TWO PALATALLY MAXILLARY IMPACTED CANINES AND FORCED TRACTION ON RIGID ARCHES OF STABILIZATION. CASE REPORT

M. MUCEDERO, C. PEZZUTO, M. ROZZI, M.R. RICCHIUTI, P. COZZA

Department of Clinical Sciences and Translational Medicine, University of Rome "Tor Vergata", Rome, Italy

SUMMARY

Objective. Young adult patient treated for impaction of two maxillary canines.

Methods. C.S., 15 years, female. Diagnostic evaluation by clinical and radiographic examinations shows permanent dentition with persistence of 5.3 and 6.3, impaction of 1.3 and 2.3, dento-skeletal CI I malocclusion, normodivergence of bone bases. Analysis of TC dentalscan confirms the palatal impaction of 1.3 and 2.3. The treatment plan provided an orthodontic-surgical approach for adequate space management in dental arch, evaluation of eruption movements, choice of anchorage device, surgical exposure and application of the brackets.

Results. Deciduous canines have been extracted and an edgewise appliance with rigid rectangular full thickness archwires has been used to align the arches and to obtain maximum anchorage during the forced traction. The surgical phase, for exposure of 1.3 and 2.3 respectively, performed an open technique by excisional uncovering and a close technique by a repositioned flap. The case has been finalized for the achievement of the right occlusal keys.

Conclusion. The possibility to choose the surgical technique depending on the intraosseous position of impacted teeth in association to the edgewise therapy with full thickness arches allows to realize an effectiveness surgical-orthodontic approach for the forced traction of impacted teeth in a favourable position.

Key words: tooth impaction, adult treatment, impaction, orthodontic-surgical approach, anchorage device.



Introduction

The palatal impaction of maxillary permanent canines is a dental anomaly often encountered in orthodontic practice (1). The prevalence rate of maxillary canine impaction varies from 1 to 3% (2). An impaction is diagnosed when the tooth is in an infraosseous position after the expected time of eruption and in this case a surgical-orthodontic approach is needed (3). In the open approach, a circular excision of the oral mucosa immediately overlying the impacted tooth is performed. Therefore the bone over the crown is removed to create a window to expose the canine and an orthodontic attachment is placed. Closed

eruption method of surgical exposure involves a degree of palatal bone removal to uncover the ectopic canine and the palatal flap is sutured back intact (1, 4, 5). A bonded attachment is placed to the crown of the exposed canine at operation and only a twisted wire or a gold chain passing through the mucosa is left to apply the orthodontic traction (6). Many techniques have been proposed for moving a palatally impacted canine into the arch following surgical exposure (7-9). Several Authors (10-12) have described a principal technique used to extrude impacted canines. The general principle is to tie an elastic force from the emerging tooth to a heavy wire engaged in adjacent teeth (6). However, the mechanics of traction can vary, depending on clini-

cian's preferences. The common point to all techniques is that the anchorage is entirely supported by the teeth themselves (7-10, 12).

Aim of this report was to describe a case of bilateral palatal impaction of permanent maxillary canines in an adult female patient who had a twin sister with a similar problem. The case was treated using different surgical approaches in two sides. The orthodontic anchorage during the forced traction, applied to guide the impacted canines directly towards the center of the alveolar ridge, is performed with a rectangular stabilization arch.



Methods

A 15-year-old Caucasian girl was referred to the Department of Orthodontics of the University of Rome "Tor Vergata" for orthodontic consultation. She had a twin sister who was also presented to our attention. A review of the medical story showed nothing remarkable. The patient's face was symmetric, and she had balanced facial pattern with a good profile, but a not aesthetic smile. Intraoral clinical examination showed a permanent dentition with the exception of the persistence of the maxillary deciduous canines that were firm to the digital pressure (Figure 1). The other twin exhibited a failure of eruption of the right permanent canine too. Occlusal analysis revealed a permanent molar Class I and a deciduous canine Class I, normal overjet and overbite, maxillary diastema. No maxillary permanent canines were palpated in the labial sulcus while palatal mucosa palpation indicated a bulge in the anterior right area above the primary canine. The panoramic radiograph showed an anomalous infraosseous position of 1.3 and 2.3 and the roots of the remaining deciduous canines displayed low amount of resorption (Figure 2). An initial evaluation of the impacted canines position was taken using the measurements proposed by Ericson and Kurol (13) as follows:

- *α-angle*, the mesial inclination of the crown of the permanent canine to the midline, was

25° for the right permanent maxillary canine and 15° for the left permanent maxillary canine;

- *distance d*, the distance between the canine cusp tip and the occlusal plane (from the first molar to the incisal edge of central incisor), was 0.8 mm for the right canine and 10 mm for the left canine;
- *sector s*, the mesial position of the crown of the impacted tooth with respect to the central and lateral incisors; the right permanent canine was in sector 3, the left permanent canine cusp overlooked sector 4. CT-3D scans revealed a palatal impaction of both upper canines and no amount of root resorption of the adjacent lateral incisors. Right permanent maxillary canine cusp tip was located mesial to the erupted lateral incisor root with the crown at the level of the root's coronal third. Left permanent maxillary canine cusp tip overlaid the distal half of the omolateral incisor root, with the crown at the level of the root's middle third. The transaxial images showed a deeper position of the left permanent canine and a more mesial orientation of the right permanent canine. This condition was confirmed by panorex images (Figure 3). Cephalometric analysis on the lateral cephalogram revealed a skeletal Class I malocclusion (ANB T_1 : 2°) and a normodivergence of bone base (FMA T_1 : 25°). Lower incisor showed a good inclination on the mandibular plane (IMPA T_1 : 89°). The following treatment objectives were established: recovery of the palatal impacted teeth and orthodontic finishing to create a stable functional occlusion. Our treatment plan consisted of an orthodontic-surgical approach that provided an adequate space management in the dental arch; the evaluation of the eruption movements and the choice of the anchorage device; the surgical exposure, bonding and guided traction of the impacted canines towards the center of the alveolar ridge; the final orthodontic treatment to align the permanent canines in the maxillary arch.



Figure 1
Pretreatment extraoral and intraoral photographs.

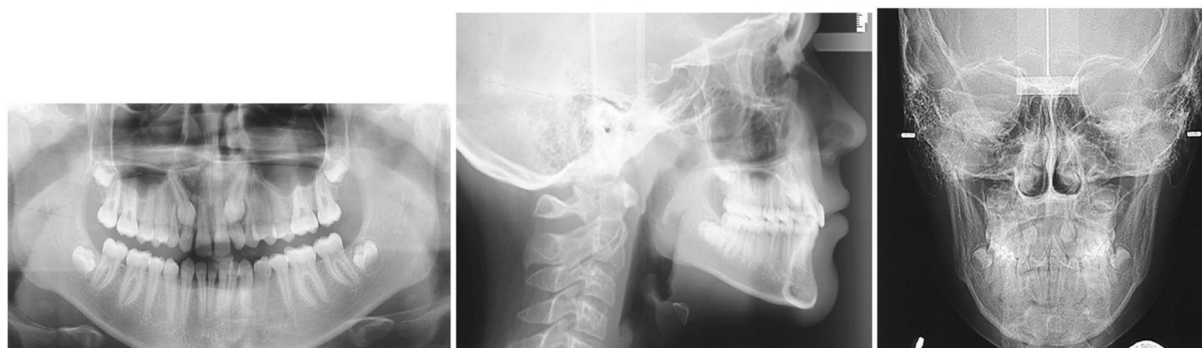


Figure 2
Pretreatment panoramic radiograph and lateral and frontal cephalometric radiographs.



Figure 3
Pretreatment computed tomography images.

Course of treatment

Considering the good occlusal situation, the initial orthodontic phase was aimed at closing the anterior diastema and levelling and alignment the maxillary arch. Molar bands and brackets were placed on all teeth except the elements 5.3, 6.3 and a 0.017-in x 0.025-in multibraid stainless steel archwire was applied. Open coil-springs were positioned in the area of 1.3 and 2.3 to increase and maintain the space for the permanent canines while the deciduous canines were maintained until the surgical exposure. The left permanent canine showed a deeper position than the right one that, on the contrary, revealed a more mesial orientation. The right canine required disto-buccal movements, while the left canine needed mostly movements in vertical and buccal direction. The programming of the necessary movements for the recovery and the position of the impacted canines allowed the choice of a rigid rectangular full thickness arch to obtain the maximum anchorage during the forced traction. Afterwards surgical exposure of 1.3 and 2.3 was performed. An open eruption technique was chosen for the right canine that showed a more superficial position. It has involved a surgical circular excision of the overlying palatal mucosa and the removal of a small amount of bone covering the impacted canine. A button with a gold chain for the guided traction was bonded to the palatal surface of the crown during

surgery and a periodontal pack was then placed over the exposed tooth. A closed eruption method was decided for the left canine that appeared in a deeper position. This technique has provided to make a palatal flap leaving intact mucosa, and to remove a bone covering the impacted canine. A gold chain connected to an attachment was bonded to the crown of the exposed canine at operation and the palatal mucosa was sutured back into place with the end of the gold chain extending into the mouth through the wound margin. During surgery, deciduous canines were removed. After 7 to 10 days both the periodontal pack and the sutures were removed (Figure 4). The patient returned two weeks later, after soft tissue healing of both sides. Traction of the impacted maxillary canines was made with an elastomeric chain (60-90 g) tied with tension to the open coils. A 0.017-in x 0.025-in stainless steel stabilization wire was used for the entire period of the orthodontic traction and until recovery of the canines in the arch. The patient was seen every three weeks. Interim panoramic radiograph was taken after 6 months to verify the root positioning and the progress in eruption of impacted elements. An improvement in α -angle, distance d and sector s was shown (Figure 5). After 7 months the right maxillary canine was near the arch and the left canine pierced the palatal mucosa (Figure 6) but only once the impacted teeth had completely erupted (12 months after the first traction), the brackets were bonded to the labial surface of their crowns and tied to a



Figure 4
Intraoral photographs of the surgical phase and the anchorage device.



Figure 5
Interim panoramic radiograph and lateral and frontal cephalometric radiographs.

0.016-in Australian stainless steel to begin the final orthodontic phase. Maxillary canines alignment and levelling proceeded with successively thicker arch wires up to a 0.017x0.025. Finalizing of the mandibular arch was achieved with a sequence of 0.016-in NiTi and 0.016-in x 0.022-in stainless steel wires. Active treatment took 24 months. Retention was accomplished with removable acrylic retainers. The patient was instructed to wear the retainers only at night. She is currently on routine patient recall. The long-term observation at 12 and 24 months from the

end of therapy showed a very good maintenance of the treatment results.

Results

Both canines were recovered in the maxillary arch. The impacted teeth were positioned into proper alignment with the assistance of direct traction, producing a complete anterior dentition with good alignment of the gingival margins and the improved smile. The elements responded



Figure 6
Eruption of the permanent canines.

well to vitality test. From a periodontal point of view a good band of labial keratinized gingiva was present, and pocket depth ranged from 1 to 2 mm. The patient showed an attractive smile and a balanced profile. Good intercuspation was achieved and midlines were coincident. There was a good dental alignment in the upper arch, which showed a well-shaped form. The final aesthetic result was good, with gingival margins at the same level (Figure 7). The final radiographs indicated intact roots, proper root alignment, and no root disease (Figure 8).

Long-term evaluation

Twenty-four months after the end of the orthodontic treatment, the smile was stable and the follow-up of the stability and periodontal health of maxillary permanent canines showed that the teeth placed in the occlusion maintained both aesthetics and function (Figure 9). The follow-up records showed the stability of proper root alignment, and the absence of root disease (Figure 10).

Discussion

This report described a case of bilateral palatal impaction of permanent maxillary canines in a young adult female patient. When a canine is palatally impacted, the best treatment involves surgical exposure and orthodontic traction in order to bring the impacted tooth to the line of occlusion (10). Our choice for the orthodontic traction was to use a rectangular stabilization arch to obtain adequate anchorage and maintain sufficient space in the dental arch. This option allowed to apply the orthodontic traction to guide the impacted canines directly towards the center of the alveolar ridge (14). In previous publications (15, 16), a combined surgical (flap) and orthodontic (direct traction towards the center of the ridge) approach has been proposed with the aim of simulating the physiological eruption pattern of the canine. Finally the position of canine root should be considered. When the canine has been positioned in the dental arch, the root is often located palatally and additional buccal root torque is required (10). In this case report, it was necessary to add buccal torque to the canines' roots despite the orthodontic forced traction sim-



Figure 7
Post-treatment extraoral and intraoral photographs.



Figure 8
Post-treatment panoramic radiograph and lateral and frontal cephalometric radiographs.

ulated the naturally eruption pattern of the canine. Aim of our protocol was to treat a patient

with bilateral palatal impacted maxillary canines by two different surgical approaches. The right

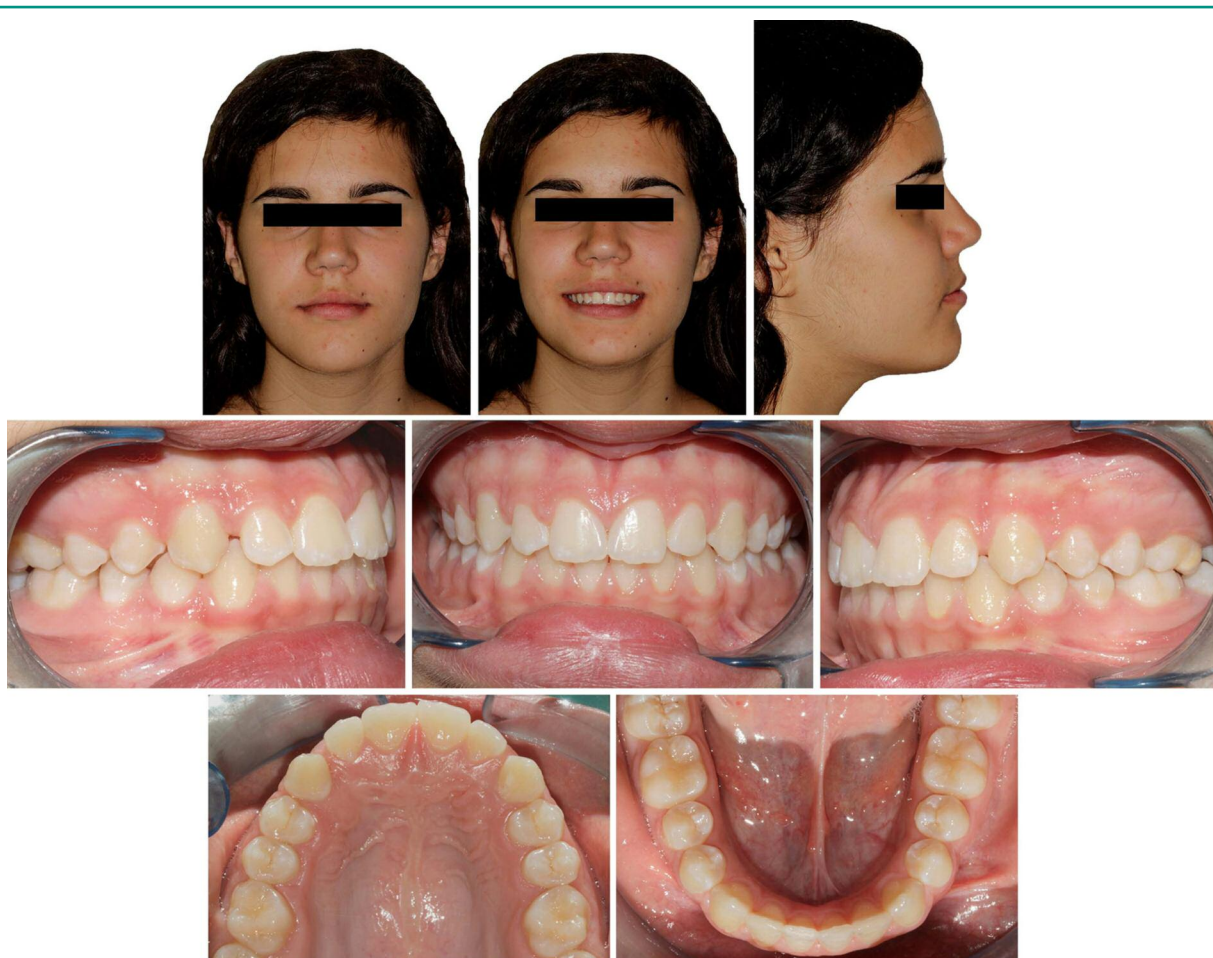


Figure 9
Extraoral and intraoral photographs twenty-four months after the end of the orthodontic treatment.



Figure 10
Panoramic radiograph and lateral and frontal cephalometric radiographs twenty-four months after the end of the orthodontic treatment.

permanent canine had a more mesial orientation but superficial position that the left permanent canine which showed a deeper position. For this reason, our treatment strategy provided to treat the right canine by an open technique and the left canine by a closed technique. Indeed, the surgical-orthodontic treatment should simulate the natural eruption pattern of the impacted tooth through the attached gingival tissue. All palatal gingiva is attached; therefore, both the closed and the open surgical methods are appropriate (17). In this report, to apply the orthodontic traction, a button attached to a gold chain was bonded to the exposed surface of the canines and there was no bond failure or necessity of a second operative procedure. Both the canines erupted completely after 12 months of orthodontic traction because the right canine showed a more superficial position but a more mesial inclination that the left canine. The important question for the clinician is whether one of the two commonly used surgical techniques is less harmful to long-term periodontal health. Unfortunately, a review of the relevant literature fails to produce a clear answer to this question. Several Authors (10, 18, 19) claim that the closed eruption technique benefits the patient in terms of comfort and long-term periodontal health. Other Authors (10, 20) support the open eruption method because it reduces the risk of a second surgical exposure. At the present time, the available scientific evidence does not support the view that a surgical technique has an advantage over the other in terms of long-term periodontal health (17, 21). In this case no differences in labial keratinized gingiva and in pocket depth were observed at the end of orthodontic treatment. Besides, good hygiene and no inflammation levels were observed at the recall evaluation between the recovered teeth. Therefore the results support the proposal by Burden et al. (21) and Smailiene et al. (17) that neither surgical technique is more advantageous than the other.



Conclusion

This clinical case reports on the quality of treatment outcomes and demonstrates that overall good long-term esthetic results can be achieved by treating impacted palatal maxillary canines with a surgical (open and closed eruption approaches) technique associated with orthodontic forced traction on rigid arches of stabilization (14, 19).



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Correspondence to:

Manuela Mucedero
Fondazione Policlinico Tor Vergata PTV
Department of Orthodontics
Viale Oxford 81
00133 Rome, Italy
E-mail: mmucedero@tin.it