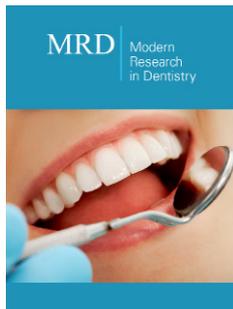


Decreasing the Risk of Incisor Root Resorption during the Orthodontic Management of Palatally Impacted Canines: Case Report

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Emad Hussein*, Sari Amer, Stathis Efstathiou, Mohammad A Mowais, Nezar Watted, Khaled Qattawi and Manal Samarah

Clinical master program of orthodontics, Arab American University of Palestine, Palestine

Abstract

Palatally impacted canines can lead to root resorption of adjacent incisors; root resorption can also result due to orthodontic treatment when unplanned orthodontic movements occur close to the incisors roots. Care should be taken during the first stages of tooth movements in order to avoid root resorption. The first tooth movement of the impacted canine should aim to take the canines away from the roots of incisors. This case report represents an example how we avoided root resorption of teeth adjacent to the impacted canine by taking the canines away by a modified transpalatal bar.

Keywords: Canine impaction; Root resorption; Modified bar

Introduction

The second most frequently impacted teeth are the canines, just behind the third molars [1]. Many studies showed that the incidence of maxillary canine impaction ranges between 0.24% to 3%, which varies depending on the ethnicity [2-5], this condition affects females 2 to 3 times more frequently than males [2,6]. According to the literature, 85% of canine impactions occur palatally and 15% buccally [7]. Many studies found that unilateral impaction ranges from 60-92% [8-11].

Palatally impacted canines can lead to root resorption of adjacent incisors; root resorption can also result due to orthodontic treatment when unplanned orthodontic movements occur close to the incisors roots [12-16]. Care should be taken during the first stages of tooth movements in order to avoid root resorption. The first tooth movement of the impacted canine should aim to take the canines away from the roots of incisors [17-20]. The movement should be directed distally and lead to vertically up righting the canine in the palate. In this article, we will discuss a case of bilaterally impacted canines treated by surgical exposure with orthodontic traction and alignment by the use of a modified double Transpalatal bar [21-25].

Case Report

S.K is a 16-year old female who presented with the main complaint of impacted maxillary canines as informed by her dentist. She presented with a symmetric face and competent lips (Figure 1A). Upon smiling, she showed a reduced appearance of anterior teeth under lip line, and a 3mm midline diastema (Figure 1B). S.K had a straight profile with increased lower anterior height. This patient had a Class III skeletal discrepancy due to a hypoplastic maxilla and a slightly prognathic mandible. The flared upper incisors and the perioral soft tissue masked the skeletal discrepancy (Figures 1C & 1D) and (Figure 1K). Intraorally, she had

***Corresponding author:** Emad Hussein, Professor, Clinical master program of orthodontics, Arab American University of Palestine, Palestine

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proclined upper anterior teeth with a midline diastema, increased overjet and average overbite. The deciduous maxillary canines were retained. Palatal bulges were present on both sides of palatal midline indicating palatally impacted canines (Figures 1E-I).



A



B



C



D



E



F



G



H



I



J



K

Figure 1 (A-K): Pretreatment orthodontic records, extra and intra-oral pictures, panoramic and lateral skull x-rays.

S.K had a Class II molar relationship with slight maxillary constriction; a crossbite was present between the upper right deciduous canine and lower right first premolar. 1mm of space was evident in the lower arch (Figure 1E-I). The panoramic x ray shows

the presence of all teeth including wisdom teeth; the maxillary canines were impacted behind the lateral incisors and crossing the lateral incisors pulp canal line (Figure 1J).

Treatment plan

Treatment plan of this case aimed to create enough space for the maxillary impacted canines and to bring the impacted canines to the arch, to correct the anterior teeth inclination, and to accept the dentoalveolar compensation of the skeletal discrepancy.

Treatment progress

A palatal appliance “double transpalatal bar” was designed, which is comprised of a Transpalatal bar and a 3-helix bar. Both bars were soldered on first molar bands Figure 2. The purpose of the 3-helix bar is an anchorage for the elastic thread that pulls the impacted canines away from the roots of the incisors. After vertical eruption of canines, the 3-helix bar is cut, and the second transpalatal bar is left in place for anchoring the maxillary first molars (Figure 3A).



Figure 2: Modified transpalatal bar with the impacted canines being uprighted through the attachments from the lingual surface to the bar-helices.

Pinnacle®.022” orthodontic bracket appliances from Ortho Technology® South Carolina, USA with their version of the McLaughlin, Bennett, and Trevisi prescription were bonded; alignment and leveling were performed; deciduous canines were extracted, and space was opened to accommodate the erupting canines (Figures 3A-E).

Surgical exposure was carried out using a closed technique. Eyelets (Ortho Technology) were bonded during surgery and Elastic Threads (Ortho Technology), pulling the impacted canines from the roots of the incisors started, were fixed on the helices. Flap was closed and changing the elastic thread was carried out every three weeks (Figures 3A-E).

After canines were vertically up-righted and away from the incisors, bonding of two eyelets on the labial sides of these canines was performed, and traction of the canines to the arch started

(Figure 3D) and (Figures 4A-E). When canines were close to the arch, .016" TruFlex™ Nickel Titanium Archwire (Ortho Technology) wire was used to align the canines and to bring them out of crossbite (Figure 5A-C), (Figures 6A-C) and (Figures 7A-C). During a later stage, eyelets were removed and replaced by canine brackets (Figure 8A-H).



A



B



C



D



E

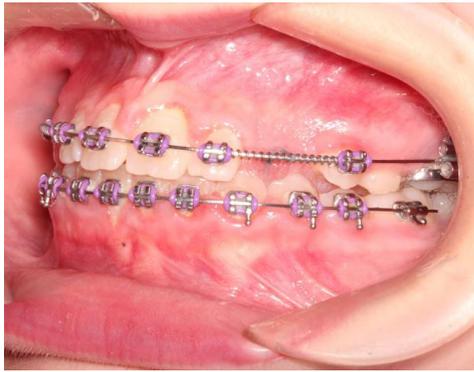
Figure 3 (A-E): Labial attachment of the impacted canines after up righting them away from incisors' roots.



A



B



C

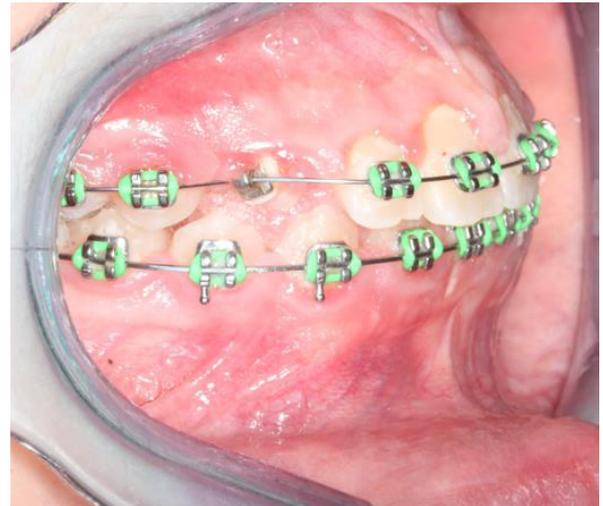


D

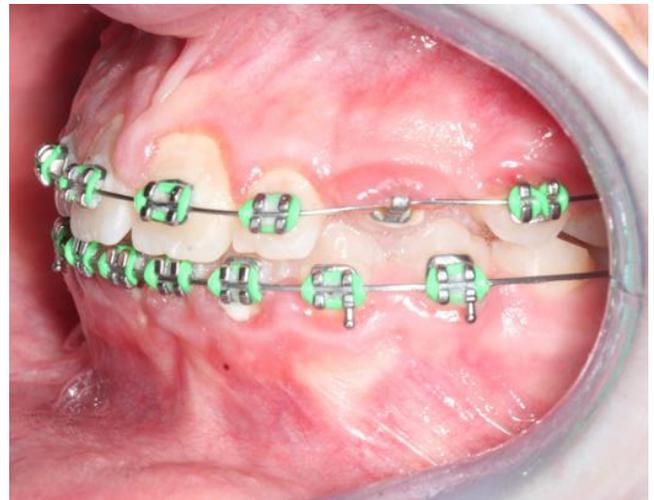


E

Figure 4 (A-E): Continued traction of the impacted canines to the arch by elastic thread from the main archwire in a direction to their prepared places.

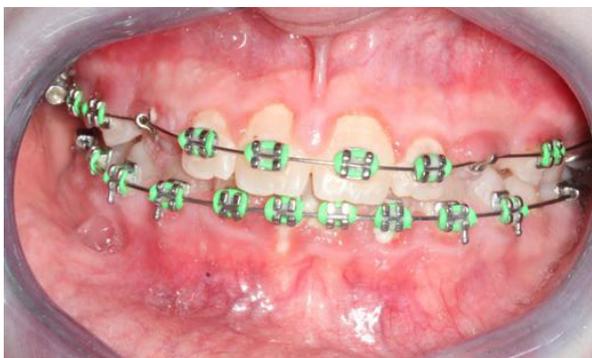


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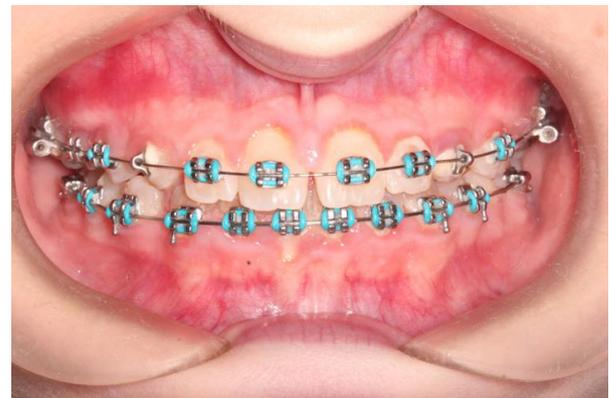


C

Figure 5 (A-C): Alignment of the canines by direct engagement of the NiTi wire through the eyelets.



A



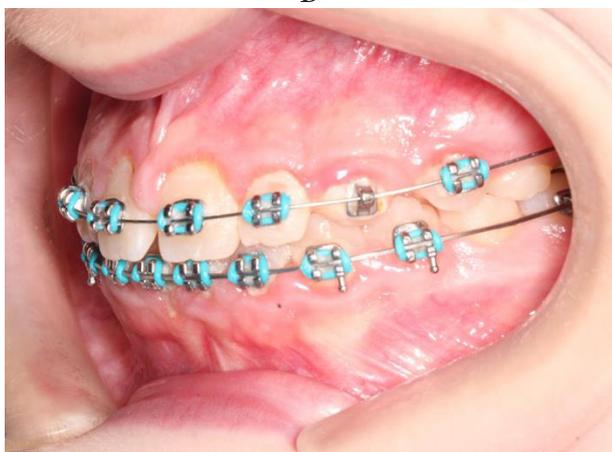
A



B



B



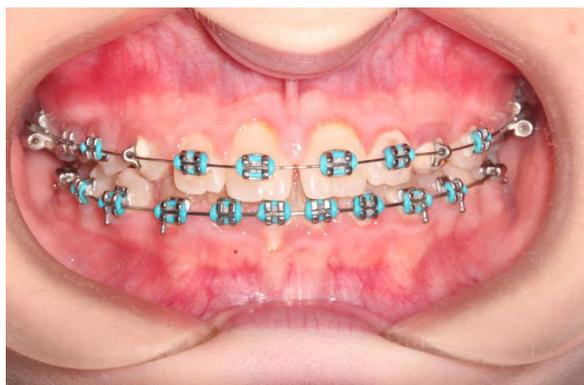
C



C

Figure 7 (A-c): The canines are aligned by the eyelet-NiTi wire before replacing the eyelets by brackets.

Figure 6 (A-C): Continued canines alignment by the NiTi wire.



A



A



B



C



D



E



F



G



Figure 8 (A-H): Leveling and alignment completed spaces mesial and distal to the upper lateral incisors maintained to correct the Bolton discrepancy.

Leveling and alignment continued and torque of the upper incisors was adjusted. Finally, maxillary canines were placed in position with proper angulation and torque (Figures 9A-C) and (Figure 10A&B).

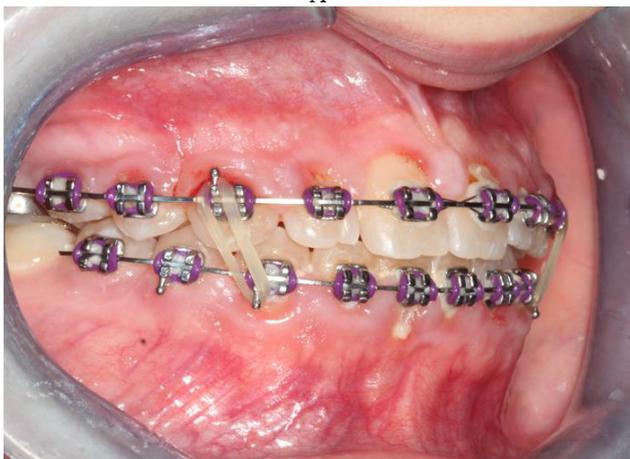


C

Figure 9 (A-C): Settling the occlusion by vertical elastics.



A



B



A



B

Figure 10 (A,B): Panoramic and lateral skull x-rays before debonding.

Discussion and Conclusion

Various complications can occur in the presence of palatally impacted canine [26,27]. Root resorption of the adjacent incisors is common sequelae that should be well considered in the treatment plan. Earlier studies by Ericson and Kurol using conventional radiography, estimated that in 12.5% of the ectopically maxillary canines caused some resorption of the adjacent incisors [12].

Later on, with the emergence of CT as an essential diagnostic tool, Ericson reported that root resorption had occurred in 38% of the lateral incisors and 9% of the central incisors [28], while other studies reported 25% - 67.7% root resorption for lateral incisor and 5%-18% for the central incisor [28-30]. 50% more root resorption detection was reported when using CT compared to intraoral x rays [28]. A recent study, using CBCT to determine the main factors associated with the palatal displaced canines and incisor root resorption, concluded that canines in contact with adjacent incisor roots was the only risk factor for incisor root resorption, while canine angulation and proximity to midline were not considered factors affecting root resorption [31].

The treatment of impacted canines can be by either the surgical exposure followed by orthodontic traction of the palatally impacted canine, or the extractions of the impacted canines and leaving the first premolar in place of the impacted canine.

The most important step during orthodontic treatment of a palatally impacted canine is to start by taking the impacted canine away from the roots of the incisors after correct diagnosis and surgical exposure; this can be achieved by up righting the palatally impacted canine vertically in the palate.

Several methods were described for traction of the canines, using a Ballista spring and pulling them from a Transpalatal bar and more recently the use of miniscrews to achieve this purpose.

We suggest the use a combined Transpalatal bar and a 3-helical bar appliance, the helices will be the site of attachment of the elastic thread to pull the canines away from the incisors and when the canines are up righted, the helical bar is removed, and a TPB is left in place for anchorage purposes.

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