



Management of Class II Division 2 Malocclusion with Maxillary Canine Retention

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Abstract

Orthodontic treatment of class II division 2 malocclusion is recognized as being difficult to treat and susceptible to recurrence, especially if complicated by other anomalies such as canine retention. This case report describes the particularities of the therapeutic management of class II division 2 malocclusion associated with maxillary canine retention. A 21 years old female patient complained about her gummy smile and the absence of the right maxillary canine with the persistence of the deciduous canine. The orthodontic management of the current case consisted of a treatment without premolar extraction with class II mechanics and traction of the retained canine. Successful mechanical management led to the improvement of the patient's facial and smile aesthetics with the placement of the retained canine in its correct position on the arch as well as the restoration of normal skeletal and dental relationships.

Subject Areas

Orthodontics

Keywords

Class II Division 2, Canine Retention, Deep Bite, Orthodontics, Canine Traction

1. Introduction

Class II malocclusion is one of the most common in orthodontic practice [1]. This malocclusion may have many consequences and its correction is requiring efficient treatment mechanics.

Class II division 2 malocclusion phenotype exhibits a combination of various features among which, the retroclination of maxillary incisors is the most dis-

tinctive sign [2]. The palatal region of the maxillary incisors is commonly susceptible to trauma due to the deep overbite and well-pronounced curve of Spee [3].

Orthodontic treatment of class II division 2 malocclusion is recognized as being difficult and prone to recurrence, even more if it's complicated by other anomalies including canine retention.

Canines are the second most common case of dental retention, following third molars [4]. There are two main theories associated to upper palatal canine retention: the eruption guide theory and the genetic theory. Other authors have underlined the involvement of local factors such as: dental arch discrepancies (lack of space), insufficient primary canine root resorption, prolonged retention or early loss of primary canine, ankylosed permanent canine, cysts or neoplasms, root dilacerations, upper lateral incisor agenesis, peg-shaped lateral incisor and changes during lateral incisor root forming phase [5].

Canine retention in class II division 2 malocclusion is not common. According to Al Balbeesi *et al.* [6], the highest frequency of impacted canines was found in patients with a Class III skeletal discrepancy (44.4%), while the lowest frequency was found in Class II division 2 (11.1%).

The treatment of the canine retention in class II division 2 malocclusion represents a unique challenge to the orthodontist. Effective biomechanical configuration is needed for alignment and management of the deep bite. The canine's position in the esthetic zone also requires well conducted mechanics in order to place it in the correct position on the arch with careful management of soft-tissues [7].

The main purpose of this article is to describe, through a clinical case, the particularities of the therapeutic management of class II division 2 malocclusion associated with maxillary canine retention.

2. Case Description

2.1. Diagnosis and Etiology

A 21 years old female patient presented for orthodontic treatment with a chief complaint related to her gummy smile and the absence of the maxillary right canine. No medical or family histories were reported. She had a symmetrical oval face, a flat profile with correct nasolabial angle and a normal lower facial height. Smile analysis showed a gummy asymmetric smile with the presence of buccal corridors (**Figure 1(A)**).

Intraorally, the hygiene was adequate. The maxillary midline was deviated to the right side. She had an important overbite with inclination of occlusal plane. Moreover, she presented a rotation of the maxillary right lateral incisor, a linguo-version of the maxillary left lateral incisor and the persistence of the deciduous maxillary right canine with the permanent canine cusp appearing in palatal position. She had a class II canine and molar on the left side and a class I molar and undetermined canine class on the right side. The mandibular arch presented a moderate crowding. She had a deep curve of Spee (**Figure 1(B)**).

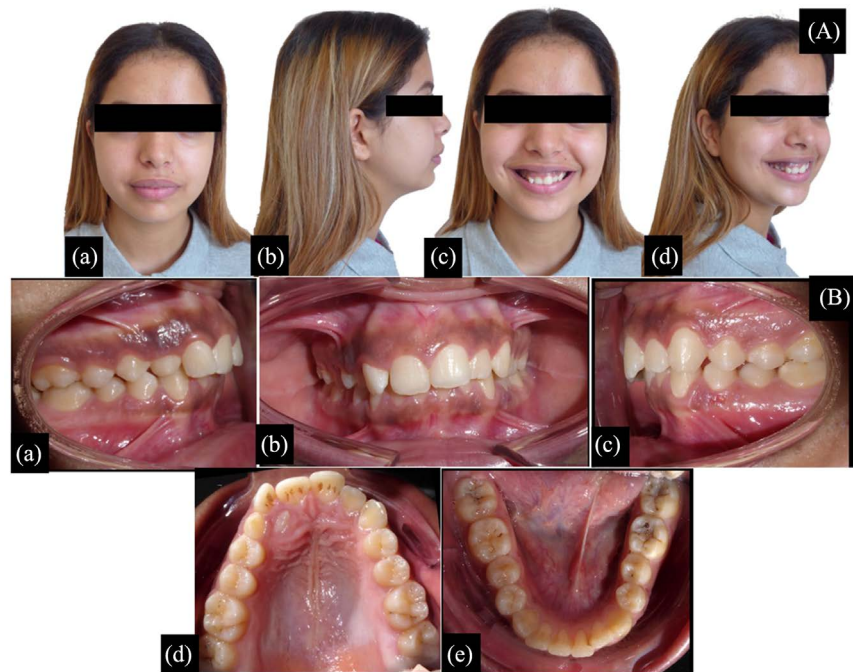


Figure 1. (A) Pretreatment extraoral photographs. (a) Frontal at rest, (b) profile, (c) frontal smiling, (d) lateral smiling. (B) Pretreatment intraoral photographs. (a) Right lateral, (b) frontal, (c) left lateral, (d) maxillary occlusal, (e) mandibular occlusal.

The panoramic radiograph showed normal skeletal and alveolar structures, with the persistence of the deciduous maxillary right canine (53) and the permanent maxillary right canine (13) being retained in palatal position and superimposed on the images of the right maxillary incisors (12 and 11) (**Figure 2(A)**).

The lateral cephalogram showed normal upper airway, anterior deep bite and maxillary incisors retrusion (**Figure 2(B)**). The cephalometric analysis indicated that the maxilla and the mandible were in retroposition to the skull base ($SNA = 71^\circ$; $SNB = 76^\circ$). The patient presented a Class II normodivergent skeletal relationship ($ANB = 5^\circ$, $GoGn/SN = 39^\circ$, $FMA = 25^\circ$) (**Table 1**).

Concerning the dental diagnosis, the patient had an important overbite (4 mm), retroclined maxillary incisors ($I/NA = 14^\circ$, $I/NA = 3$ mm) and proclined mandibular incisors ($i/NB = 32^\circ$, $i/NB = 6$ mm) (**Table 1**).

Clinical and radiological data confirmed the diagnosis of class II division 2 malocclusion with canine palatal retention.

2.2. Treatment Objectives

The treatment objective was to respond to the patient's complaint related to her gummy smile and the absence of the maxillary right canine. Our objectives were to correct the deep bite, to place the retained maxillary right canine on the arch and to restore Class I canine and molar relationships. We also aimed to ensure correct incisors relationship in order to improve smile aesthetics and ensure long-term stability of corrections.



Figure 2. Pretreatment radiographs (A) Panoramic radiograph, (B) Lateral cephalogram.

Table 1. Cephalometric analyses before and after treatment.

		PRE TRT	POST TRT			PRE TRT	POST TRT
Cephalometry	Objective			Cephalometry	Objective		
SNA	82°	76°	77°	FMA	25° ± 3°	25°	28°
SNB	80°	71°	72°	FMIA	67° ± 3°	57°	56°
ANB	2°	5°	5°	IMPA	88° ± 3°	98°	96°
SND	76°	68°	70°	AoBo	-2 mm à +2	+3 mm	+2 mm
I/NA	22°	14°	20°	Occl to PF	10°	12°	10°
I/NA mm	4 mm	3 mm	4 mm	Angle Z	75° ± 5°	73°	71°
i/NB	25°	32°	33°	Upper Lip	/	12 mm	9 mm
i/NB mm	4 mm	6 mm	7 mm	Total Chin	/	13 mm	11 mm
I/i	131°	128°	121°	PFH	45 mm	46 mm	43 mm
Pog/NB		1 mm	1 mm	AFH	65 mm	67 mm	61 mm
GoGn/SN	32°	39°	40°	FHI	0.69	0.69	0.7

Considering the skeletal bases balance, the pleasant facial esthetics and the type of malocclusion which is a class II division 2 malocclusion, one treatment plan was discussed: Orthodontic treatment without extraction of premolars, extraction of deciduous maxillary right canine and the traction of the retained canine.

2.3. Treatment Progress

Treatment was initiated with 0.022" × 0.028" edgewise appliance. The upper arch was first bonded in order to intrude upper incisors and to allow mandibular bonding (Figure 3(A)). The deciduous canine was removed and NiTi open coil spring was placed between the 12 and 14 to open the space to the retained 13 (Figure 3(B)). Alignment and leveling were accomplished in 6 months with sequential nickel-titanium (NiTi) archwires (014", 016", 016 × 022" and 017 × 025").

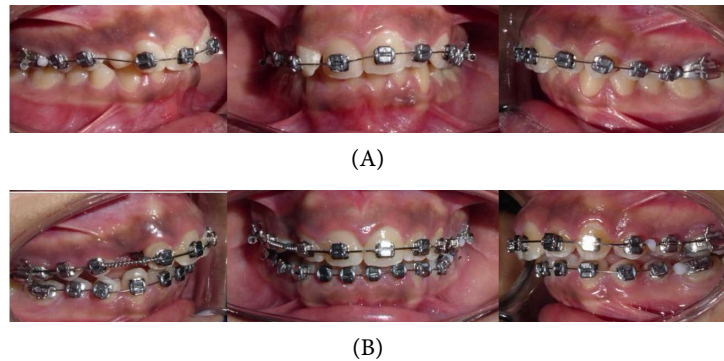


Figure 3. Upper arch bonding to intrude incisors (A) Alignment and canine space opening (B).

Next, the 13 was pulled to the arch with the aid of chains. The canine was pulled first to the distal with a chain towards the 16 to move it away from the lateral incisor, then gradually towards the buccal archwire. In fact, the canine was pulled on a rigid 0.017×0.025 stainless steel archwire with a chain and once it got closer to the arch a flexible 016" NiTi archwire was used to directly ligate the canine (**Figure 4**). The correction of the excessive overbite was successfully performed thanks to the curve of Spee control and the succession of arch sequences.

Once the canine was in place, the correction of arch shape was performed using 0.017×0.025 and 0.019×0.025 stainless steel archwires (**Figure 5(A)**). The correction of inter-arch relationship was carried out using class II mechanics and intermaxillary elastics. The finishing phase was achieved by introducing 1st and 2nd order informations (**Figure 5(B)**).

2.4. Treatment Results

After 24 months of treatment, brackets were debonded. A fixed retainer wire was placed on both maxillary and mandibular arches.

At the end of orthodontic treatment, the treatment objectives set at the beginning of the treatment were achieved; the retained canine was in place, the deep bite and class II malocclusion were corrected.

Final records showed improved facial aesthetics and a wide pleasant smile with correction of the gummy smile and the buccal corridors (**Figure 6(A)**). The occlusion relationship, the overbite as well as the midline deviation were corrected (**Figure 6(B)**).

In the panoramic radiograph, dental and periodontal health were maintained. The right maxillary canine 13 and adjacent teeth showed no root resorption (**Figure 7(A)**). The lateral cephalogram revealed the improvement of facial profile and the correction of the deep bite (**Figure 7(B)**).

Final cephalometric analysis showed the correction of the class II skeletal relationship ($AoBo = 2$ mm). The mandibular incisors were maintained in their position ($i/NB = 33^\circ$ and $i/NB = 7$ mm) and maxillary incisors retroclination was corrected ($I/NA = 20^\circ$ and $I/NA = 4$ mm) (**Table 1**). Cephalometric superimpo-

sition demonstrated the maintenance of the lower facial height and the improvement of the upper incisors position (**Figure 8**).

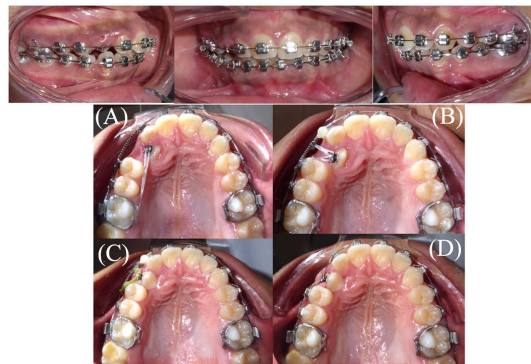


Figure 4. Set of photographs showing the different stages of the canine traction (A) canine traction towards the 16, (B) canine traction to the buccal archwire, (C) canine near the buccal archwire, (D) canine directly ligated to NiTi archwire.

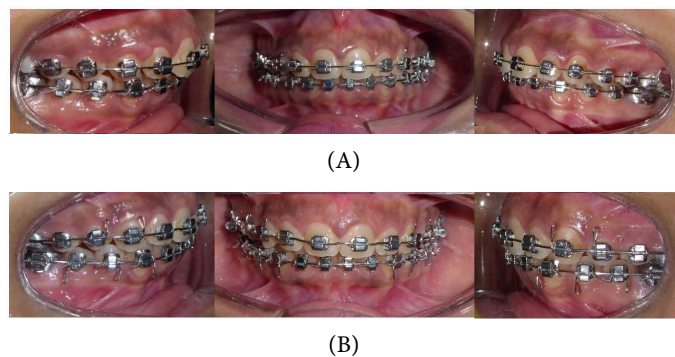


Figure 5. Placement of the canine and intra-arch correction (A) Finishing and establishment of Class I occlusion (B).

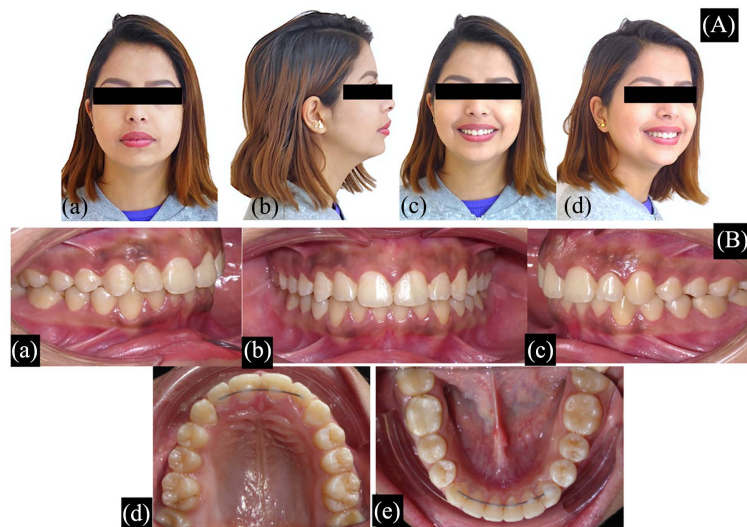


Figure 6. (A) Final extraoral photographs. (a) Frontal at rest, (b) profile, (c) frontal smiling, (d) lateral smiling. (B) Final intraoral photographs. (a) Right lateral, (b) frontal, (c) left lateral, (d) maxillary occlusal, (e) mandibular occlusal.

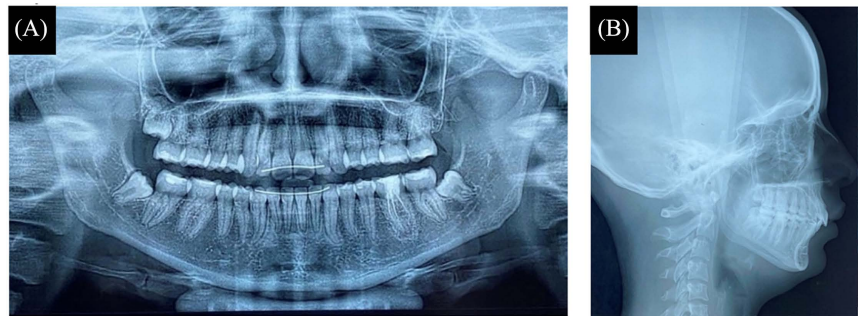


Figure 7. Posttreatment radiographs (A) Panoramic radiograph, (B) Lateral cephalogram.

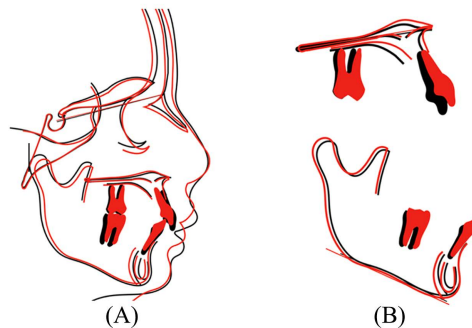


Figure 8. Total superimposition (A), maxillary and mandibular superimpositions (B) of initial (black) and final (red) cephalometric tracing.

3. Discussion

The treatment of patients with class II division 2 malocclusion presents a challenge to the orthodontist. Deep bite correction is one of the primary goals of orthodontic treatment [8]. Asakawa and *et al.* [9] showed that in a class II division 2 malocclusion, decompensating by buccal inclination of incisors without extracting premolars is the treatment of choice. It enables the mandible to be brought forward and the Class II dental and skeletal relationships to be corrected. Similarly, Ackerman and *et al.* [10] showed that incisors proclination is preferred to tooth extraction to correct class II division 2 malocclusion in patients with a balanced profile and no lip contraction. Thus, in our patient, who presented balanced skeletal bases and pleasant facial esthetics, the treatment plan was an orthodontic treatment without extraction of premolars.

Orthodontic options to treat excessive overbite include extrusion of the posterior teeth, incisor intrusion, a maxilla clockwise rotation, increasing the lower anterior facial height, or even flattening the curve of Spee [11]. However, despite all the possible orthodontic mechanics to treat this type of malocclusion, Parker and *et al.* [8] stated in their study that the different systems have the same effect, although orthodontic mechanics offer different possibilities and appliances that can be used. In our patient, the correction of the excessive overbite was successfully performed by incisors intrusion and the curve of Spee control thanks to the succession of arch sequences.

Class II division 2 may be accompanied by canine retention due to lack of

space in a narrow maxilla. The management of retained canines associated with class II division 2 malocclusion involves the following steps: Firstly, the space around the retained tooth should be opened up, and the arches aligned and leveled, taking into account the need to reinforce the anchorage. Next, surgical exposure and orthodontic traction of the retained maxillary canine is considered. Final orthodontic treatment is performed to align the retained tooth with the maxillary arch and establish Class II mechanics.

According to Pignoly and *et al.* [12] the directions and forces of the traction need to be carefully thought out in order to move the tooth into its final position on the arch in optimal conditions. The periodontal setting will be optimized and checked at every step of the treatment. In the present clinical case, the post treatment image evaluation did not show signs of external root resorption of neither the tractioned tooth nor adjacent teeth. The canine was tracted towards the palatal direction to avoid buccal alveolar bone loss and prevent contact with the roots of adjacent teeth, as recommended by the literature [13].

With right mechanics during class II division 2 malocclusion management, successful skeletal, dental, and profile outcomes may be achieved [7]. In our patient, the treatment of inter-arch relationship was carried out using class II mechanics. The intermaxillary elastics were used to correct the dental midlines shift. The correct incisor inclination was maintained by good torque control. Consequently, Class I canine and molar relationships were attained along with ideal overbite and overjet.

Considering the facial aspect, the profile improved considerably, with maintenance of the already satisfactory nasolabial angle and improvement of the mentolabial angle. The vertical dimension control led to the correction of the deep bite which, in turn, made the lower third of the face more vertically proportional. The smile became wider thanks to the correction of buccal corridors and the better anterior teeth exposure.

One major challenge after treatment of a class II division 2 malocclusion is the long-term stability [14]. The interincisal angle might play a crucial role in the stability of deep overbite correction. The reduction of the interincisal angle by over-correcting the palatal root torque as well as the relative lowering of the lower lip-line allow stable results after treatment [15].

The retention phase is particularly important in class II division 2 malocclusion, with regard to prevent an increase in overbite, to retain any derotated teeth and to maintain alignment of the lower labial segment. In adult patients, permanent retention is preferable [15].

4. Conclusions

The class II division 2 malocclusion presents specific diagnostic and therapeutic features. Its treatment represents a challenge for the orthodontist. Management becomes more complex when the malocclusion is accompanied by significant dento-maxillary disharmony with tooth retention.

The effective mechanical management of this clinical case has led to the im-

provement of the patient's facial aesthetics, the restoration of a Class I skeletal and dental relationship, the correction of deep bite, and the establishment of functional anterior guidance.

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Conflicts of Interest

The authors declare no conflicts of interest.

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