



Case Report

Bone regeneration after alveolar dehiscence due to orthodontic tooth movement – A case report

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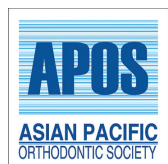
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ABSTRACT

This article presents the orthodontic treatment of a 15 year old male patient with an Angle class I malocclusion with a class II skeletal base, lower incisor proclination along with a hyperdivergent facial pattern. Such situations that involve camouflage treatment, usually results in further lower incisor proclination which can be reduced to an extent by adding buccal root torque. Placement of additional torque in this case however, resulted in positioning of the root apex of the lower right lateral incisor outside the alveolar housing, although no gingival signs were present. The mechanics were then reversed and at the end of 21 months of treatment, the apices were back within the alveolar housing. A 4-year post-treatment cone-beam computed tomography showed normal bone coverage of the affected tooth; and no clinical signs of gingival pathology were present. Orthodontists should be aware of possible complications of excessively torquing lower incisors in order to prevent proclination. If root apices are inadvertently moved through the cortex, a good long-term prognosis is possible using orthodontics alone by reversing the mechanics, if no gingival complications are present.

Keywords: Bone regeneration, Alveolar dehiscence, Non-extraction treatment, Insignia, Angle's class II camouflage, Lower incisor proclination

INTRODUCTION

While performing non-extraction orthodontic therapy, there is an inevitable tendency to procline the lower incisors. While not ideal, it is usually regarded as an acceptable compromise when camouflaging skeletal base discrepancies.^[1] To minimize proclination, buccal root torque can be added to the archwire. This case report shows the sequelae of excessive lower incisor torque using a customized appliance and the long-term results after correction. An anterior negative 20-degree pre-torqued 19×25 NiTi wire was placed in the lower arch and the patient did not return for 3 months. This resulted in the apices of the anterior lower incisors being placed outside the alveolar housing. To correct this, the wire was then flipped and reinserted to obtain positive torque. After 4 months, the roots were back within the alveolar bone according to cephalometry. Four years after treatment, a cone-beam computed tomography (CBCT) scan indicated that there was normal and adequate bone covering of the lower incisor roots with no sign of any adverse effects.

Animal studies^[2-5] have previously reported that the occurrence of bone reapposition after teeth was initially expanded through the cortical plate and then returned toward their normal positions in the arch. Wainwright,^[2] Karring *et al.*,^[3] Engelking and Zachrisson,^[4]

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Figure 1: Initial records of the patient.

and Thilander *et al.*^[5] all concluded that dehiscence or fenestrations can be produced in the buccal alveolar plate by moving teeth in a facial direction and that the bone will reform when the teeth are moved back toward their original positions. Only Engelking and Zachrisson^[4] showed gingival recession after dehiscence or fenestration formation, which was also not recovered after moving the teeth back to their original positions.

A case report by Pazera *et al.*^[6] showed a deformed lower fixed retainer causing approximately 35 degrees of buccal root torque of the lower right canine. A CBCT showed the apex of the tooth outside of the cortical bone; however, the tooth was vital and had only mild recession. The patient was then retreated orthodontically and a new CBCT was taken before debonding. They found minor bone regeneration around the apical and buccal surfaces.

CASE REPORT

A 15-year-old male patient presented for orthodontic treatment for the correction of crowding. Extraoral examination showed a convex profile with lip incompetence, increased lower facial height, and a flat smile arc. Intraoral examination exhibited a Class I molar and canine relationship, 2 mm overjet, and 1 mm overbite. Both upper and lower arches were asymmetrical with a collapse in the

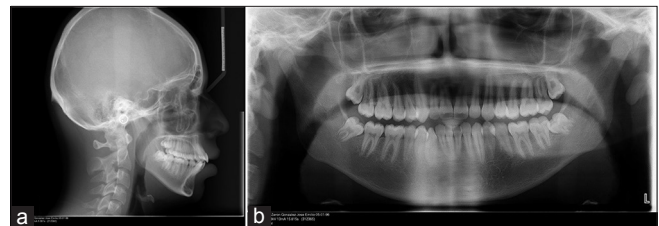


Figure 2: (a and b) Initial radiographic records. Note the presence of the third molars, the mild vertical pattern, and the proclination of upper and lower incisors.

buccal segments of the 2nd and 3rd quadrants resulting in scissor bites of the upper left 2nd premolar and 2nd molar. Crowding of 2 mm in the upper arch and 6.5 mm in the lower arch was found. A Bolton discrepancy with excess tooth material in the lower arch was present (1.7 mm anterior and 7 mm total) [Figure 1].

A panoramic radiograph showed that all teeth were present with potentially impacted 3rd molar. Cephalometric examination indicated a skeletal Class II relationship with a mild dolichofacial pattern and proclined and protruded upper and lower incisors [Figure 2 and Table 1].

Treatment goals involved resolving upper and lower crowding, correcting the teeth in scissor bite, maintaining Class I occlusion, and improving smile esthetics.

Table 1: Initial cephalometric measurements.

	Value	Norm	Std. dev.	Dev. norm
Craniofacial relation-Cranial structure				
Cranial length (mm)	62.1	60.3	2.5	0.7
Posterior facial height (Go-CF) (mm)	69.7	61.0	3.3	2.6
Cranial deflection (°)	31.1	29.6	3.0	0.5
Porion location (mm)	-44.0	-37.0	2.2	-3.2
Ramus position (°)	77.7	77.5	3.0	0.1
Craniofacial relation-Mx position				
Maxillary depth (FH-NA) (°)	93.2	93.4	3.0	-0.1
Maxillary height (N-CF-A) (°)	61.5	58.3	3.0	0.9
SN-Palatal plane (°)	7.0	7.3	3.5	-0.1
Craniofacial relation-Md position				
Facial angle (FH-NPo) (°)	89.0	91.0	3.0	-0.6
Facial axis-rickets (NaBa-PtGn) (°)	83.1	89.2	3.5	-1.7
FMA (MP-FH) (°)	31.6	23.5	4.5	1.8
Total face height (NaBa-PmXi) (°)	64.4	60.0	3.0	1.5
Facial taper (°)	59.4	68.5	3.5	-2.6
Maxillo-Mandibular relationship				
Convexity (A-Npo) (mm)	4.7	3.2	2.0	0.8
Corpus length (Go-Gn) (mm)	85.2	75.8	4.4	2.1
Mandibular arc (°)	34.7	33.7	4.0	0.3
Lower face height (ANS-Xi-Pm) (°)	50.8	44.5	4.0	1.6
Dental relationships-Mx dentition				
U-Incisor protrusion (U1-APo) (mm)	12.4	6.7	2.3	2.5
U1-FH (°)	120.8	111	6	1.6
U incisor inclination (U1-APo) (°)	36.1	30	4	1.5
U6-PT vertical (mm)	21.6	19	3	0.9
Dental relationships-Md dentition				
L1-Protrusion (L1-Apo) (mm)	9.5	3.6	2.3	2.5
L1 to A-Po (°)	33.6	27.7	4.0	1.5
Md incisor extrusion (mm)	-0.1	2.4	2.0	-1.2
Hinge axis angle (°)	99.2	90.0	4.0	2.3
Dental relationships-Mx/Md dentition				
Interincisal angle (U1-L1) (°)	110.3	124.0	6.0	-2.3
Molar relation (mm)	-2.8	-1.6	1.0	-1.2
Overjet (mm)	2.9	3.4	2.5	-0.2
Overbite (mm)	-0.2	2.8	2.0	-1.5
Occ plane to FH (°)	7.9	8.5	5.0	-0.1
Esthetic				
Lower lip to E-Plane (mm)	6.4	-2.0	2.0	4.2
Summary				
Class I molar relationship				
Skeletal Class II (A-Po)				
Skeletal Class II (ANB)				
High mandibular plane angle				
Open bite				
Facial pattern: mild vertical				

Treatment options included extraction and non-extraction treatment; however, a non-extraction plan was agreed on, using a customized appliance (Insignia®) with low torque compensations in the customized brackets (labial root torque) and lower interproximal stripping and intermaxillary elastics [Figure 3].

Treatment proceeded first with a 14 CuNiTi archwire in the upper and lower arches (5 months), followed by 14×25 CuNiTi (5 months, with Class II elastics used on the left), 18×25 CuNiTi (1.5 months – Class II elastics on left), 19×25 TMA (3 months – bilateral Class II elastics), and 19×25 NiTi with 20 degrees buccal root torque to upright

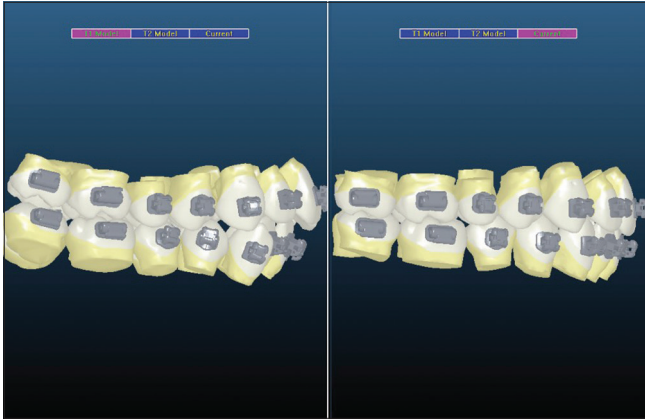


Figure 3: T1 and T2, appover program from Insignia®, showing the correction of Class II with intermaxillary elastics.



Figure 4: Lateral cephalometry showing the apex of the lower incisor completely out of the alveolar bone due to the excessive negative torque in the archwire.



Figure 5: Clinical view of the affected lower right lateral incisor showing minimal signs of gingival recession, despite the apex being out of the cortical bone.

incisors. The patient did not attend his appointment until 3 months later.

On his return, a cephalometric radiograph was taken which showed that the apex of one of the lower incisors was completely out of the alveolar bone [Figure 4]. Clinically, it appeared that the lower right lateral incisor was the tooth affected, although there were minimal signs of gingival recession and all teeth were vital [Figure 5]. The 19×25 NiTi with 20 degrees torque was then flipped to express positive torque (lingual root torque) for 4 months.

Finishing was performed using 19×25 TMA and treatment completed in 21 months with fixed retainers placed from 3 to 3 in the upper and lower arches [Figure 6]. There appeared to be no visible adverse effects on the periodontium. A cephalometric radiograph taken at debonding showed the roots of the lower incisors within the alveolar housing [Figure 7].

A panoramic radiograph taken at debonding showed acceptable root angulations, no evidence of root resorption, and stable bone levels. The radiograph did reveal impaction of the lower left 3rd molar [Figure 8]. Cephalometric superimposition [Figure 9] showed reduced upper and lower incisor proclination, resulting in an increased interincisal angle.

The patient returned after 4 years post-treatment with a stable occlusion despite debonding and loss of the lower fixed retainer [Figure 10]. Clinical assessment showed that the periodontium around the lower incisors was healthy, and a CBCT (Kavo OP 3D, 5 cm×5 cm, 85 μ) was taken to further assess the status of the lower incisors. The CBCT showed good bone coverage of the roots with no apparent adverse effects from the orthodontic treatment [Figure 11].

DISCUSSION

The patient in this report had severe dehiscence of the lower incisors, but surprisingly no apparent periodontal pathology. Merely placing the roots back into the alveolar bone resulted in a favorable long-term result. The question arises that if there were periodontal issues, would the same treatment be effective? According to Engelking and Zachrisson,^[4] it would not. Therefore, if periodontal pathology was present, it would likely be better to also perform a bone and connective tissue graft. According to Mandelaris *et al.*,^[7] a pre-treatment CBCT could improve prediction of alveolar bone changes caused by orthodontic tooth movement and can influence periodontal decision-making if lower incisor protrusion is initially predicted, especially in hyperdivergent patients.^[8,9] In such a case, periodontally accelerated osteogenic orthodontics could be performed initially to increase the scope of treatment.^[10,11]

CONCLUSION

Orthodontists should be aware of possible complications of excessively torquing lower incisors to prevent proclination.



Figure 6: Final records of the patient. The treatment was completed in 21 months using Insignia®.



Figure 7: Final cephalometry showing the roots of the lower incisors within the alveolar bone.

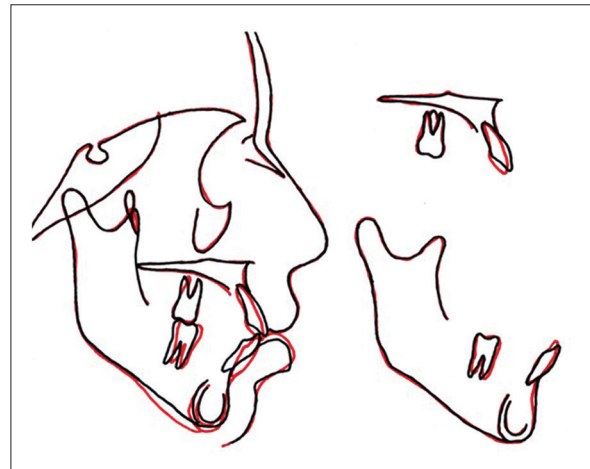


Figure 9: Superimpositions showing the increase of the interincisal angle.



Figure 8: Final panoramic radiograph showing acceptable root angulations, no evidence of root resorption or alveolar bone loss and an impacted lower left 3rd molar.

Although permanent damage could occur, it is imperative to note that a good long-term prognosis is possible using orthodontics alone, especially if there is no gingival pathology.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.



Figure 10: Four years post-treatment records, with stable occlusion and a healthy periodontium around the lower incisors.

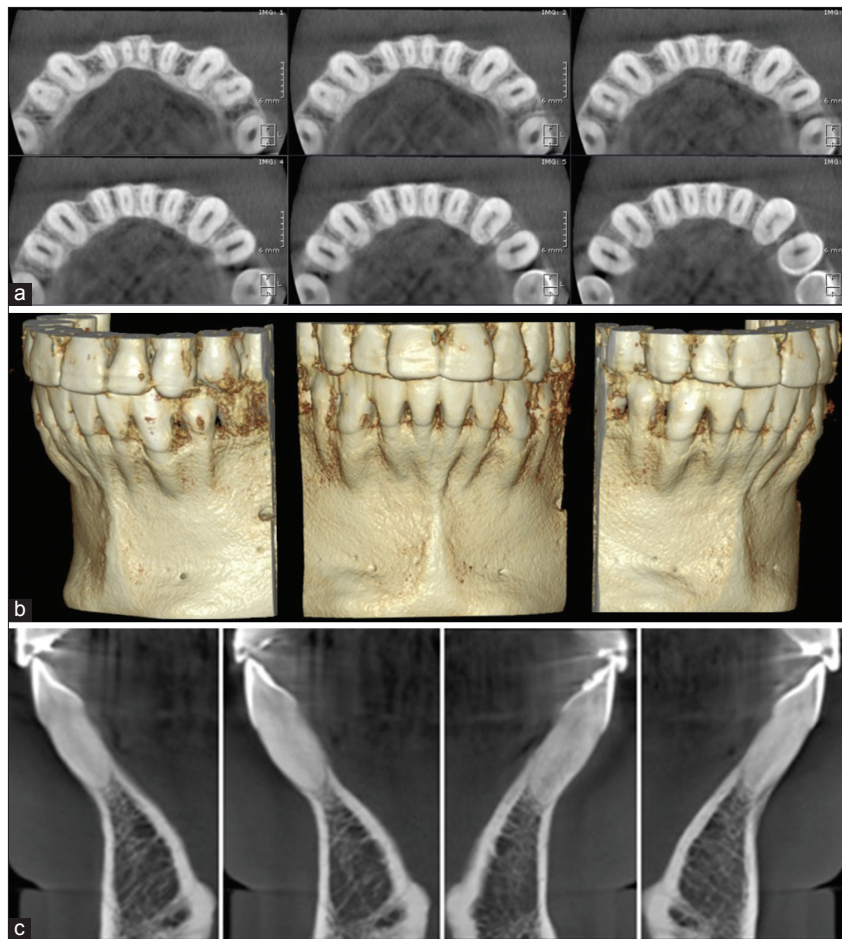


Figure 11: (a-c) Cone-beam computed tomography 4 years post-treatment showing normal coverage with no apparent adverse effects from the orthodontic treatment.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Handelman CS. The anterior alveolus: Its importance in limiting orthodontic treatment and its influence on the occurrence of iatrogenic sequelae. *Angle Orthod* 1996;66:95-109.
2. Wainwright WM. Faciolingual tooth movement: Its influence on the root and cortical plate. *Am J Orthod* 1973;64:278-302.
3. Karring T, Nyman S, Thilander B, Magnusson I. Bone regeneration in orthodontically produced alveolar bone dehiscences. *J Periodontol* 1982;17:309-15.
4. Engelking G, Zachrisson BU. Effects of incisor repositioning on monkey periodontium after expansion through the cortical plate. *Am J Orthod* 1982;82:23-32.
5. Thilander B, Nyman S, Karring T, Magnusson I. Bone regeneration in alveolar bone dehiscences related to orthodontic tooth movements. *Eur J Orthod* 1983;5:105-14.
6. Pazera P, Fudalej P, Katsaros C. Severe complication of a bonded mandibular lingual retainer. *Am J Orthod Dentofacial Orthop* 2012;142:406-9.
7. Mandelaris GA, Neiva R, Chambrone L. Cone-beam computed tomography and interdisciplinary dentofacial therapy: An american academy of periodontology best evidence review focusing on risk assessment of the dentoalveolar bone changes influenced by tooth movement. *J Periodontol* 2017;88:960-77.
8. Kim YS, Cha JY, Yu HS, Hwang CJ. Comparison of mandibular anterior alveolar bone thickness in different facial skeletal types. *Korean J Orthod* 2010;40:314-24.
9. Molina-Berlanga N, Llopis-Perez J, Flores-Mir C, Puigdollers A. Lower incisor dentoalveolar compensation and symphysis dimensions among class I and III malocclusion patients with different facial vertical skeletal patterns. *Angle Orthod* 2013;83:948-55.
10. Brugnami F, Caiazzo A, Mehra P. Can corticotomy (with or without bone grafting) expand the limits of safe orthodontic therapy? *J Oral Biol Craniofac Res* 2018;8:1-6.
11. Ferguson DJ, Wilcko MT, Wilcko WM, Makki L. Scope of treatment with periodontally accelerated osteogenic orthodontics therapy. *Semin Orthod* 2015;21:176-86.

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