CASE REPORT

Retreatment of a Class II Patient with Short-Root Anomaly

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Short-root anomaly is an idiopathic condition that is sometimes associated with an autosomal dominant pattern of inheritance.[1,2] It affects about 1.3% of the population and is more prevalent in women.[1-3] Caused by incomplete root development rather than resorptive processes, it is usually confined to the upper incisors or premolars, but may sometimes affect the entire dentition, when it is known as generalized short-root anomaly.[3,4-6] Short-root anomalies may be associated with systemic conditions such as dysplasia type 1, scleroderma, thalassemia, Stevens-Johnson syndrome, Aarskog syndrome, Down syndrome, or Rothmund-Thomson syndrome.[4-7]

Although orthodontic treatment is not necessarily contraindicated in patients with short-root anomalies, any factors contributing to root resorption—especially of the upper incisors—should be carefully evaluated to avoid complications.[1,8,9] According to several studies, continuous forces are more likely than interrupted forces, whether light or heavy, to result in root resorption.[10-13] Therefore, stainless steel archwires seem preferable to superelastic alloys for treatment of patients with short roots.[14,15]

This article describes the retreatment of a patient with short-root anomaly who had previously undergone five years of unsuccessful orthodontic treatment, leading to anterior root resorption and adversely affecting function and esthetics.

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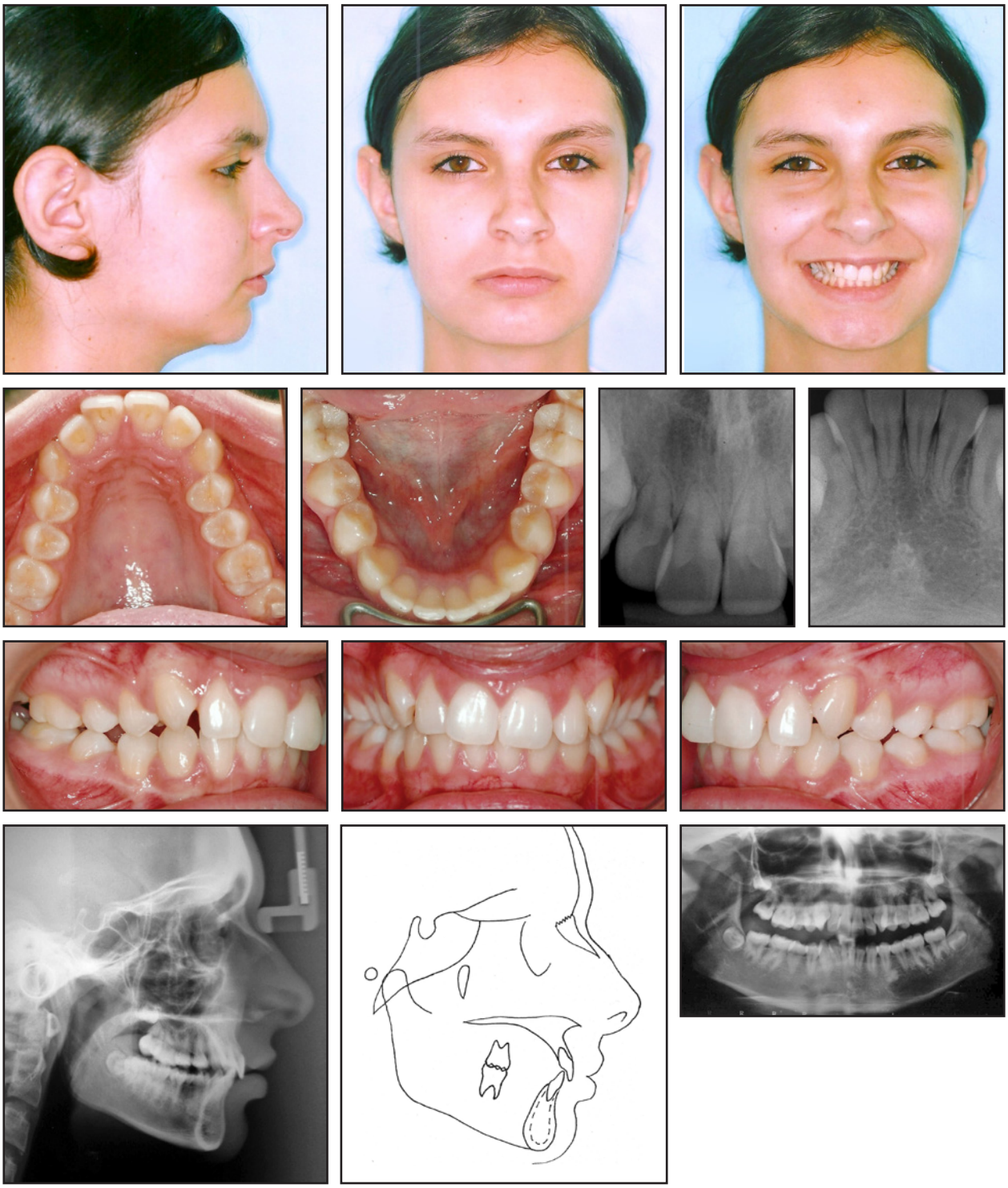

Fig. 1 13-year-old female patient with short-root anomaly before initial treatment.

Diagnosis and Treatment Planning

A 13-year-old female initially presented to another orthodontist with a mesodivergent facial pattern and a convex profile (Fig. 1). The nasolabial angle was normal, but the mentolabial angle was acute due to lower-lip eversion. Smile analysis indicated prominent buccal corridors and a canted occlusal plane. The lower midline matched the facial midline, but the upper midline was deviated 2mm to the left. The patient had a Class II, division 1 malocclusion with a 2mm overjet, a 50% overbite, and mild crowding in both arches. Cephalometric analysis confirmed a hypodivergent skeletal Class I pattern with upright upper and lower incisors (Table 1). Panoramic radiographs revealed a generalized short-root anomaly.

After five years of treatment, the patient and her parents sought an opinion from a second orthodontist because they were dissatisfied with the initial results. Clinical examination showed that the patient's Class II malocclusion had persisted; her upper midline was deviated 3mm to the left, with a central diastema and a buccal open bite on both sides (Fig. 2). In addition to a substantial transverse deficiency in the upper arch, the patient still had a 5mm overjet and a 20% overbite. Root parallelism was inadequate, and the anterior teeth exhibited minor resorption.

The treatment plan aimed to level and align the upper and lower arches, improve the archforms, and achieve an ideal Class I molar and canine relationship on both sides. Other objectives were to match the upper and lower dental midlines with the facial midline, reduce the incisal projection, and obtain ideal overjet, overbite, and disclusion guidance.

Treatment options were limited by the short-root anomaly. Because the upper anterior crown-root ratio was low (1:.5 for the lateral incisors and 1:.75 for the central incisors) and no amount of treatment would be able to increase the root length, we had to use only stainless steel archwires, without intermaxillary elastics, to avoid further root

TABLE 1
CEPHALOMETRIC ANALYSIS

	Norm	Pre-treatment	Before Retreatment	Post-Treatment
SNA	82.0° ± 3°	82.0°	80.0°	81.0°
SNB	80.0° ± 3°	80.0°	79.0°	79.0°
ANB	2.0° ± 2°	2.0°	1.0°	2.0°
NA-APog	0.0° ± 2°	0.0°	–1.0°	0.0°
PoOr-NPog	87.0° ± 3°	89.0°	90.0°	89.0°
Y-axis	59.0° ± 6°	58.0°	58.0°	58.0°
SN-GoGn	32.0° ± 3°	26.0°	25.0°	23.0°
1-NA	22.0°	21.0°	29.0°	20.0°
1-NA	5.0mm	5.0mm	9.0mm	5.0mm
1-NB	25.0°	20.0°	20.0°	30.0°
1-NB	5.0mm	3.5mm	3.5mm	4.0mm
Interincisal angle	131.0° ± 5°	141.0°	128.0°	127.0°
U1-S line	0.0mm ± 2mm	0.0mm	0.0mm	–2.0mm
L1-S line	0.0mm ± 2mm	2.0mm	3.0mm	0.0mm
IMPA	90.0° ± 4°	93.0°	95.0°	106.0°
FMA	25.0° ± 3°	19.0°	18.0°	15.0°
FMIA	65.0° ± 4°	68.0°	67.0°	59.0°

resorption. One possibility was to extract the upper right premolar to correct the canine relationship and midline, while maintaining the right molars in a Class II relationship. This would not reduce the risk of root resorption, however, since the required amount of anterior retraction would be the same as with nonextraction treatment involving molar distalization. Another option was to extract three or four premolars with the goal of correcting the Class II malocclusion and midline and reducing the incisal projection, but this would have required even more orthodontic tooth movement. Therefore, we elected to level and align the arches without extractions and to distalize the upper right segment using mini-implant anchorage.

Treatment Progress

Full .022" × .028" standard edgewise brackets were bonded in both arches. Leveling and alignment were performed using .012" to .018" stainless steel archwires with loops in the posterior segments, followed by .016" to .020" stainless steel archwires without loops (Fig. 3A). Archwires were changed every 60 days

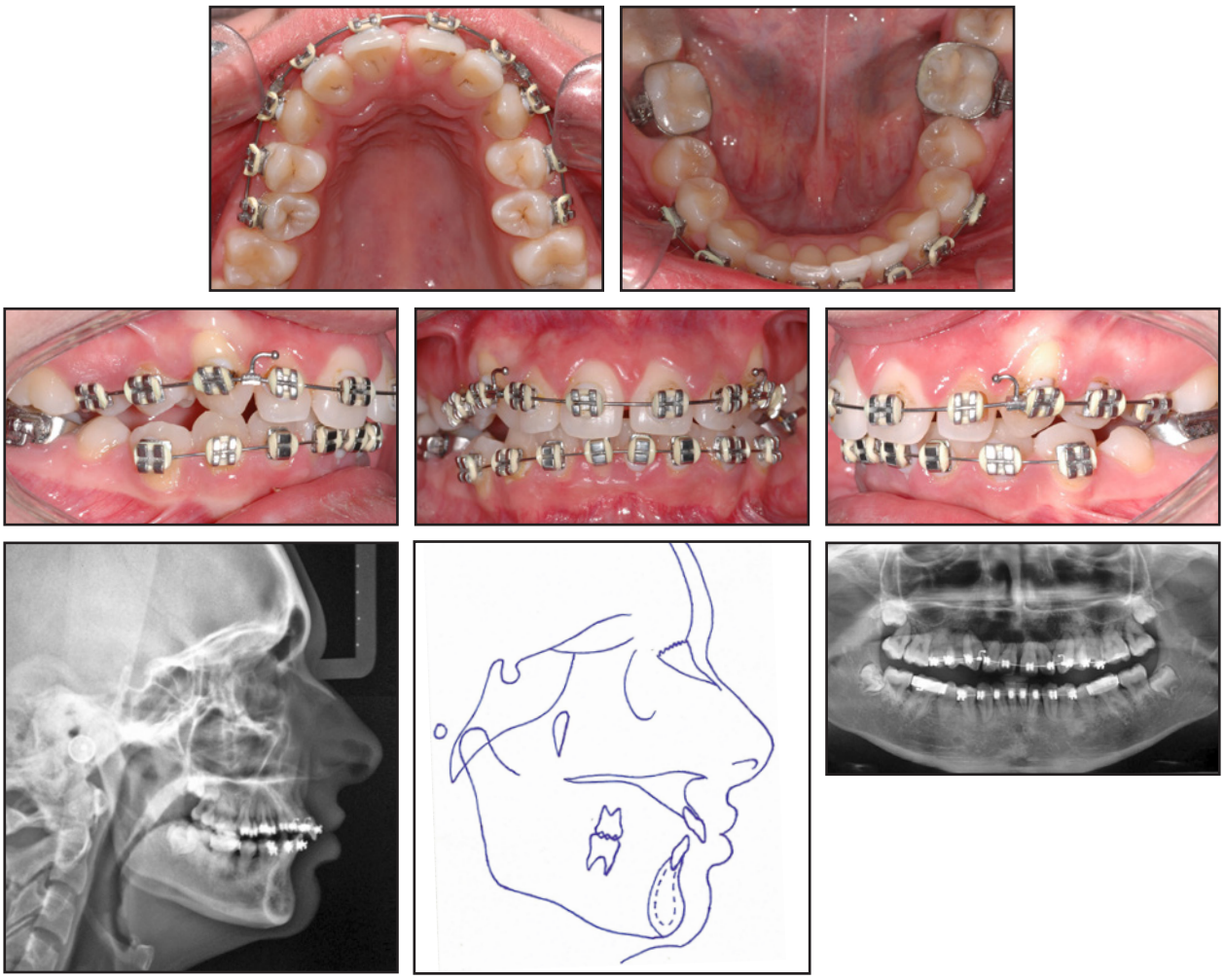

Fig. 2 Patient five years after beginning initial treatment (before retreatment).

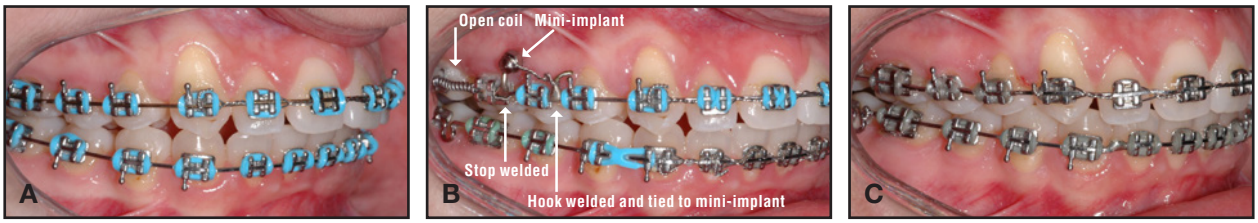

Fig. 3 A. After eight months of leveling and alignment with only stainless steel archwires. B. Distalization of upper right posterior teeth with mini-implant anchorage. C. After 12 months of distalization and anterior retraction.

to allow adequate reorganization of the periodontal ligament and to prevent hyalinization.

After an 1.6mm × 9mm mini-implant* was inserted between the upper right second premolar and upper right first molar for anchorage of nickel titanium open-coil springs, the upper right teeth were distalized individually from second molar to canine (Fig. 3B). An .018" × .025" stainless steel archwire with T-loops was then inserted between the upper lateral incisors and canines for anterior retraction. After 12 months of distalization and retraction, an .019" × .025" stainless steel archwire with no torque on the upper canines was placed to reduce the gingival recession (Fig. 3C). Fixed appliances were debonded 90 days later.

Retention involved bonded 3-3 lingual .0195" stainless steel coaxial wires in both arches, as well as a wraparound upper retainer. Total time for the retreatment was 26 months.

Treatment Results

The retreatment resulted in a slight reduction in facial convexity and an overall improvement in smile esthetics, attributable to correction of the canted occlusal plane, alignment of the midlines, and narrowing of the buccal corridors (Fig. 4A). The patient displayed a Class I molar and canine relationship and proper intercuspation on both sides, along with an ideal overjet and overbite. Panoramic radiographs showed acceptable root parallelism with no further resorption. Cephalometric analysis indicated a reduced facial convexity and proclination of the upper incisors and an increased proclination of the lower incisors (Table 1). Overall superimposition confirmed the molar distalization and the reduction in facial convexity and upper-incisor inclination (Fig. 4B).

Discussion

Although short-root anomaly is a rare condition,[2,16] patients with this problem in a localized or even generalized form (as in the case described here) may occasionally present for orthodontic treatment.[1] Because the upper incisors are not only the most likely teeth to have short roots, but also the most commonly affected by pathologic resorption during orthodontic movement,[8,13,17] it is imperative to plan treatment that will minimize the risk of anterior root resorption.

When our patient sought orthodontic retreatment, she had a Class II subdivision right malocclusion, with a 5mm overjet and a 3mm deviation of the upper midline to the left.

Both arches were constricted, and the lower arch had an accentuated curve of Spee. Extensive orthodontic movement would have been needed to obtain an acceptable occlusion. According to Weiland, constant orthodontic forces may induce as much as 140% more root resorption than interrupted forces would,[13] probably because the pauses in force application allow the resorbed cementum to heal and thus prevent further resorption.[10-12] In the present case, therefore, highly resilient archwires and intermaxillary elastics were contraindicated. Only stainless steel archwires were used for leveling and alignment, and tooth-by-tooth distalization was carried out using

*Neodent, Curitiba, Brazil; http://www.neodent.com.br/vendas-internacionais.

Fig. 4 A. Patient after 26 months of retreatment (continued on next page).

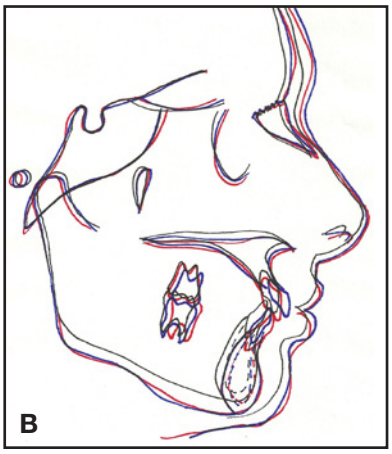

Fig. 4 (cont.) B. Superimposition of pre- and post-treatment cephalometric tracings.

mini-implant anchorage rather than Class II elastics.

The roots of all teeth, including the incisors, displayed a similar configuration before and after the retreatment. Since we had initially seen a remarkable increase in root length and accentuated mobility of the upper anterior teeth, we bonded a lingual retainer to those teeth after treatment to avoid any trauma or avulsion from overloading.

This patient's reduced crown-root ratio was clearly caused by her short-root anomaly rather than the initial orthodontic treatment. If the causative factor of root resorption had been the orthodontic movement, the resorptive process would have stopped when the initial movement stopped.[9] Therefore, it seems unlikely that the patient will experience any further root resorption after treatment, although we will continue to monitor her radiographically at six-month intervals.

REFERENCES

1. Marques, L.S.; Generoso, R.; Armond, M.C.; and Pazzini, C.A.: Short-root anomaly in an orthodontic patient, Am. J. Orthod. 138:346-348, 2010.
2. Apajalahti, S.; Holtta, P.; Turtola, L.; and Pirinen, S.: Prevalence of short-root anomaly in healthy young adults, Acta. Odontol. Scand. 60:56-59, 2002.
3. Da Silva Filho, O.G.: Short root anomaly, Ortod. SPO. 40:305-311, 2007.
4. Nagaveni, N.B.; Umashanikara, K.V.; Vidyullatha, B.G.; Sreedevi, S.; and Radhika, N.B.: Permanent mandibular incisor with multiple anomalies—Report of a rare clinical case, Braz. Dent. J. 22:346-350, 2011.
5. Vineetha, R.; Pai, K.M.; Nayak, A.G.; and Chhaparwal, Y.: Short root anomaly of a single tooth: A rare finding, Arch. Oral Res. 7:225-227, 2011.
6. Apajalahti, S.; Sorsa, T.; and Ingman, T.: Matrix metalloproteinase -2, -8, -9, and -13 in gingival crevicular fluid of short root anomaly patients, Eur. J. Orthod. 25:365-369, 2003.
7. Desai, R.S.; Vanaki, S.S.; Puranik, R.S.; Rashmi, G.S.; and Nidawani, P.: An unusual combination of idiopathic generalized short-root anomaly associated with microdontia, taurodontia, multiple dens invaginatus, obliterated pulp chambers and infected cyst: A case report, J. Oral Pathol. Med. 35:407-409, 2006.
8. Apajalahti, S.; Arte, S.; and Pirinen, S.: Short root anomaly in families and its association with other dental anomalies, Eur. J. Oral Sci. 107:97-101, 1999.
9. De Man, K.: Abnormal root development, probably due to erythema multiforme (Stevens-Johnson syndrome), Int. J. Oral Surg. 8:381-385, 1979.
10. Acar, A.; Canyurek, U.; Kocaaga, M.; and Erverdi, N.: Continuous vs. discontinuous force application and root resorption, Angle Orthod. 69:159-163, 1999.
11. Konoo, T.; Kim, Y.J.; Gu, G.M.; and King, G.J.: Intermittent force in orthodontic tooth movement, J. Dent. Res. 80:457-460, 2001.
12. Owman-Moll, P.; Kurol, J.; and Lundgren, D.: Continuous versus interrupted continuous orthodontic force related to early tooth movement and root resorption, Angle Orthod. 65:395-401, 1995.
14. Owman-Moll, P.; Kurol, J.; and Lundgren, D.: Effects of a doubled orthodontic force magnitude on tooth movement and root resorptions: An inter-individual study in adolescents, Eur. J. Orthod. 18:141-150, 1996.
15. Owman-Moll, P.; Kurol, J.; and Lundgren, D.: The effects of a four-fold increased orthodontic force magnitude on tooth movement and root resorptions: An intra-individual study in adolescents, Eur. J. Orthod. 18:287-294, 1996.
16. Roinioti, T.D. and Stefanopoulos, P.K.: Short root anomaly associated with Rothmund-Thomson syndrome, Oral Surg. Oral Med. Oral Pathol. Oral Radiol. Endod. 103:e19-e22, 2007.
17. Brezniak, N. and Wasserstein, A.: Root resorption after orthodontic treatment: Part 2. Literature review. Am. J. Orthod. 103:138-146, 1993.