Dental Traumatology

Dental Traumatology 2009; **25**: e43–e47; doi: 10.1111/j.1600-9657.2008.00755.x

Double 'pink tooth' associated with extensive internal root resorption after orthodontic treatment: a case report

CASE REPORT

Frank F Silveira[1,2], Eduardo Nunes[1], Janir A Soares[3], Cynthia L Ferreira[2], Ilan Rotstein[4]

[1]Pontifícia Universidade Católica de Minas Gerais, Belo Horizonte; [2]Universidade de Itaúna, Itaúna; [3]Universidade Federal dos Vales do Jequitinhonha e Mucuri, Diamantina, Minas Gerais, Brazil; [4]School of Dentistry, University of Southern California, Los Angeles, CA, USA

Correspondence to: Prof. Frank Ferreira Silveira, Pç Dr Augusto Gonçalves, 146 sala 909 Itaúna, Minas Gerais, Brazil 35680-054
Tel.: 55 37 32410996
Fax: 55 31 33194415
e-mail: frankfsilveira@uol.com.br

Accepted 6 October, 2008

Abstract – Advanced internal resorption affecting the crown of teeth may result in the appearance of a 'pink tooth', which, when located in the root canal, can perforate the external root surface. Therapeutically, this condition represents a clinical challenge and normally requires a combined endodontic and surgical focus. Presented herein are cases of double 'pink tooth' which appeared at different times after orthodontic treatment. In the most severe case, upon radiographic examination and computed tomography, the maxillary right central incisor presented an internal resorption, extending from the pulp chamber to the root middle third. After pulp removal, the debridement of the defect was performed using a 2.5% sodium hypochlorite solution, a #80 Kerr file, and an ultrasonic tip ST-17, aided by a surgical microscope. During the cleaning process, various sites of periodontal communication were identified. Upon controlling the hemorrhaging, the root canal was completely filled with White mineral trioxide aggregate. Within the 3-month follow-up treatment, a pink spot appeared on the maxillary left central incisor, which received conventional root canal therapy. Clinically and radiographically, over 18 months of follow up, both cases responded favorably to the proposed treatments. Therefore, it is important to monitor the patient due to the fact that pulp and periodontal sequelae can develop at varied moments after orthodontic treatment. Furthermore, with the current technology and biomaterials, it is possible to resolve cases with extensive internal perforating resorption through endodontic treatment.

Internal resorption in permanent teeth presents a clinical challenge and may result in substantial loss of tooth structure (1). Consequently, the pulp cavity undergoes localized widening at the site of the lesion (2, 3). Clinically, the condition is usually asymptomatic and detected through routine radiographic examination (1–5). Often, the process may go undetected until it reaches an advanced stage, giving the appearance of a 'pink tooth' (2, 4, 5). The pink color is due to accumulation of granulation tissue in the coronal dentin, undermining the crown (5, 6) and, regardless of its origin, the esthetic behavior alerts the patient to the problem (6, 7).

Infection and trauma to the pulp tissue have been suggested as etiological factors for internal resorption (4–9) as well as orthodontic treatment (6, 11, 12). Radiographically, internal root resorption can be recognized as punched out radiolucencies which disrupt the pulp chamber or root canal space (2, 3, 5–7, 13). Histologically, multinucleated giant cells originating from pulpal granulation tissue can be found adjacent to the inner root canal walls (8). As the internal resorptive process involves an inflamed pulp, immediate root canal treatment tends to be the treatment of choice (2, 3, 6, 8).

Advanced cases of internal resorption may complicate the prognosis of endodontic treatment due to the weakening of the remaining dental structure and possible periodontal involvement (2, 3, 12). Surgical intervention is used to remove the inflamed granulation tissue and, concomitantly, to reconstruct the defect using biomaterials (14). In this cases, the gingival recession is an esthetic sequela, which is quite common and should be avoided (16). The purpose of this report is to describe the occurrence of a double 'pink tooth' associated with internal resorption involving dental structures at different magnitudes, following orthodontic treatment with a fixed appliance treated successfully with conservative endodontic therapy.

Case report

A 21-year-old male was admitted to the endodontic clinic complaining of coronal discoloration of the maxillary right central incisor. The patient reported that he had been using orthodontic fixed braces for 2 years, which had been removed 4 months prior to his visit. There was no associated history of dental trauma. Medical history was non-contributory. Intraoral clinical examination

revealed a maxillary right central incisor with dark discoloration on the labial surface of the crown (Fig. 1) and a distinguishable 'pink spot' on the palatal surface (Fig. 2). The tooth was not associated with any caries, restorations, or periodontal pockets. The tooth presented a slight mobility and poor oral hygiene was noted. All maxillary incisors responded normally to either electric pulp tests (Vitality Scanner; Analytic Technology, Glendora, CA, USA) or cold tests (Endo-Ice; The Hygienic Corporation, Akron, OH, USA). Radiographic examination revealed an extensive radiolucency with irregular shapes, extending from the pulp chamber to the root canal (Fig. 3). Compared with the maxillary left central incisor, non-inflammatory, advanced external apical resorption could be observed involving the maxillary right central and lateral incisors. Due to the extension of the defect, a cone beam computed tomography was also performed, confirming a substantial extension of the resorption in the frontal and sagittal planes (Fig. 4).

At this point, it was decided to initiate a root canal treatment on the maxillary right central incisor tooth and attempt to repair the resorptive defect using white-colored mineral trioxide aggregate (MTA). The coronal access was carried out using spherical burs #1015 (KG Sorensen, São Paulo, Brazil), encompassing the entire resorptive coronal defect and allowing for free access to the entire intraradicular defect. Working length was established, and removal of the intracanal vital tissue was performed under copious irrigation with a 2.5% sodium hypochlorite solution (Lenza Farma, Belo Horizonte, Minas Gerais, Brazil). Debridement of the root canal was then performed with the apical third expanded

Fig. 1. Coronal discoloration of the vestibular surface of the maxillary right central incisor.

Fig. 2. A distinguishable 'pink spot' on the palate surface.

Fig. 3. Preoperative radiograph of the maxillary right central incisor revealing an extensive internal radiolucency and external apical resorption.

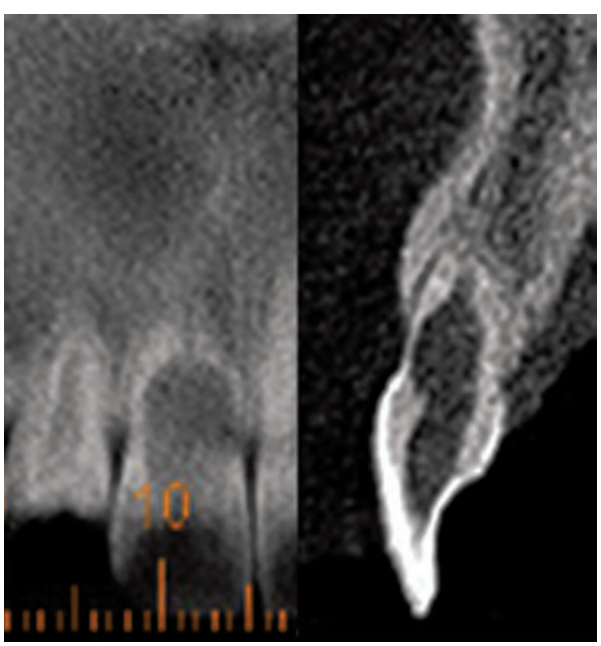

Fig. 4. Cone beam computed tomography of the affected tooth demonstrating an extension of the internal resorption in the frontal and sagittal planes.

Fig. 5. Three-month follow up showing coronal discoloration of the vestibular surface of the maxillary left central incisor.

to the #80 K-file. Cleaning of the resorbed site was done under direct visualization using a surgical microscope (DF Vasconcellos S.A., São Paulo, Brazil) at 20× magnification, thus rendering it possible to view the hemorrhaging sites of the communications with the periodontal ligament. These resorption sites were slightly widened using an ultrasonic tip ST-17 (Enac; Osada Electric Co, Ltd, Tokyo, Japan) at an average power set, while the entire area was cleaned by rinsing with alternating solutions of 2.5% NaOCl and 17% EDTA (Biodinâmica Laboratórios, São Paulo, Brazil). The root canal was then irrigated with saline solution until hemostasis was achieved. Only a fine thickness of the remaining root structure could be observed in some locations. Due to the reduction in the root canal length, caused by external apical resorption, the root canal was then dried and completely filled with White-MTA (White-MTA; Angelus Soluções Odontológicas, Paraná, Brazil), which was prepared according to the manufacturer's instructions. MTA was applied using a midget amalgam carrier and lightly compacted using an endodontic plugger. A moist, sterile cotton pellet was used to condense the material to the root canal entrance level. During the same appointment, the pulp chamber was restored using photopolymerized composite resin (Charisma; Heraeus Kulzer, Armonk, NY, USA). Immediately following treatment, the tooth regained its natural shade.

At the 3-month follow-up appointment, the tooth was asymptomatic. However, at this time, a tooth discoloration was also detected in the adjacent maxillary left central incisor (Fig. 5). Radiographic examination revealed the presence of a large radiolucent area located mainly at the level of the pulp chamber (Fig. 6). At this point, conventional root canal treatment of the maxillary left central incisor was completed in a single visit and the coronal access was restored. Upon completion of the treatment, the crown regained a natural shade (Fig. 7). At the 18-month follow-up period, no color regression was noted and both maxillary central incisors were asymptomatic and without periodontal pathosis (Fig. 8).

Discussion

Traumatic injury may be an initiating factor for internal root resorption (1–4). Another possible cause is heat

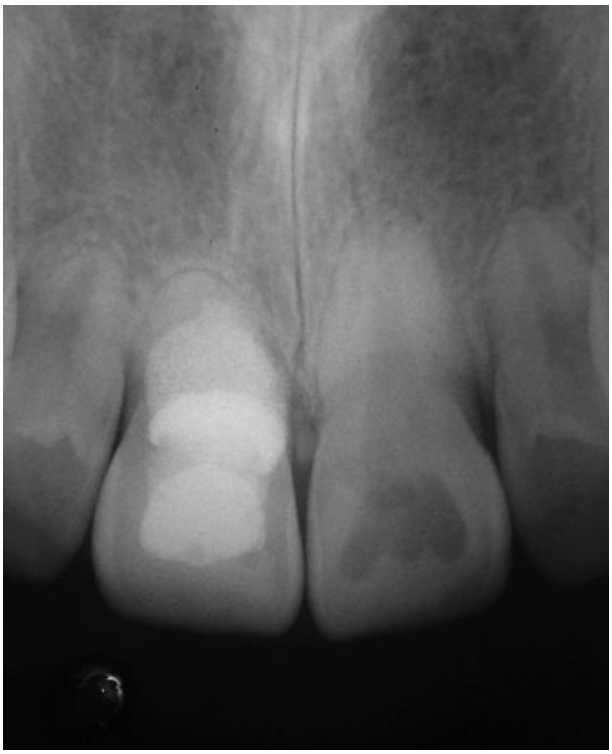

Fig. 6. Radiograph revealing a large radiolucent area at the level of the pulp chamber of the maxillary left central incisor.

Fig. 7. Restoration of esthetic coronal shade.

produced during the cutting of dentin without an adequate water coolant (1). In this case report, clinical examination revealed that both the right and left maxillary central incisors were free of caries or restorations. Also, the patient did not claim any traumatic injury. Therefore, it can be speculated that the orthodontic treatment could have initiated the resorptive process in this patient. Root resorption following orthodontic tooth movement has been well documented (6, 8, 10, 11).

Dental resorptions can develop at varying times after pulp or periodontal injuries (1, 4, 8). In the present case, the right central maxillary incisor presented non-inflammatory external apical resorption and internal advanced resorption. The beginning of root resorption differed in the two maxillary incisors. In a temporal context, based on the patient's dentistry history and taking into

Fig. 8. Eighteen-month follow-up radiograph revealing evidence of normality.

consideration that the internal resorption is progressive in nature, the resorption in the right central incisor must have begun during orthodontic treatment, yet was only perceived clinically by the patient at a very advanced stage. In contrast, this condition could have been diagnosed through a radiographic control test. Nevertheless, the patient confirmed that no radiographic evaluation was requested at any time during the orthodontic treatment, which shows professional negligence. Clinically and radiographically, the internal resorption in the left maxillary incisor appeared within a 3-month period, which can be considered a relatively short period of time. These findings reinforce the importance of the regular monitoring of patients with a history of orthodontic movement as a means through which to diagnose and treat these possible sequelae at an early stage.

Cone beam computed tomography maximizes the ability to make the diagnosis, as it can reveal the full extent of the destruction of the mineralized tissues (13). This imaging modality can also aid in the determination of the treatment plan (6, 10). Although the radiographic and tomographic examinations revealed no periodontal involvement, possible communication between the resorptive defect and the periodontal ligament was suspected. This was confirmed clinically through the use of a surgical microscope, especially in the mesial and vestibular aspects of the maxillary right central incisor.

The internal perforating resorption complicates the prognosis of treatment, especially when extensive dental destruction occurs, for the following reasons: (i) heavy hemorrhage is usually found during endodontic instrumentation; (ii) weakening of the remaining tooth structure occurs, increasing the risk of fracture; and (iii) the possible need for surgical procedures is introduced (2, 3, 8, 11, 12).

The use of a dental surgical microscope for cases of resorptive defects plays a key role in endodontic surgeries; it, for example: (i) assures adequate access to the surgical site; (ii) provides greater ease in determining the extension of the internal resorption; (iii) helps in cleaning; (iv) aids in the conservation of healthy dental tissue, an important aspect in highly damaged teeth; and (v) eliminates, in some cases, the need for periodontal surgical intervention (14–16).

Many biomaterials have been used for sealing root perforations; however, over the last decade, MTA has gained popularity due to its superior sealing ability, biocompatibility, and potential induction of osteogenesis and cementogenesis (17–22). Although MTA can be used in humid environments (17, 18), the delayed setting times may limit the use of MTA in some endodontic procedures (19). White MTA offers several advantages in these cases, as it has a reduced setting time (20), increases resistance to the fracturing of a weakened tooth (23), and is similar in color to the tooth.

Currently, the dilemma for many clinicians is when to decide to treat patients with pulpally involved teeth associated with questionable prognoses. Their extraction and subsequent replacement with an osseointegrated implant may represent an alternative treatment (24). Nonetheless, this is a surgical procedure which requires a careful assessment of the variables relative to implants (site, bone quality/quantity) and patients (systemic heath status, economics, compliance, and motivation), in addition to presenting a higher incidence of postoperative complications requiring several subsequent treatment interventions (25).

Summary

This case report describes the treatment of one patient with double 'pink tooth' associated with extensive internal root resorption after orthodontic treatment. Both cases were resolved endodontically. These cases point out that internal resorption can develop at varying times after orthodontic treatment and can cause the destruction of the mineralized tissues, thus emphasizing the need to establish periodic patient recalls. Moreover, extensive dental loss caused by perforating internal resorption can be resolved through endodontic treatment, in a single visit, using a surgical microscope, ultrasound, and White MTA, in such a way as to obtain satisfactory aesthetic, functional, and radiographic results.

References

1. Trope M, Blanco L, Chivian N, Sigurdsson A. The role of endodontics after dental traumatic injuries. In: Cohen S, Burns R, editors. Pathway of the pulp, 9th edn. St. Louis, MO: CV Mosby; 2006. p. 635–7.
2. Rabinowitch BZ. Internal resorption. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 1972;33:263–82.
3. Heithersay GS. Management of tooth resorption. Austral Dent J 2007;52(Suppl.):S105–21.
4. Wedenberg C, Lindskog S. Experimental internal resorption in monkey teeth. Endod Dent Traumatol 1985;1:221–7.
5. Walton RE, Leonard LA. Cracked tooth: etiology for ''idiopathic'' internal resorption? J Endod 1986;12:167–9.

6. Hamilton RS, Gutmann JL. Endodontic-orthodontic relationships: a review of integrated treatment planning challenges. Int Endod J 1999;32:343–60.
7. Eidelman E, Rotstein I, Gazit D. Internal coronal resorption of a permanent molar: a conservative approach for treatment. J Clin Pediatr Dent 1997;21:287–90.
8. Tronstad L. Root resorption: etiology, terminology and clinical manifestations. Endod Dent Traumatol 1988;4:241–52.
9. Robertson A, Andreasen FM, Bergenholtz G, Andreasen JO, Norén JG. Incidence of pulp necrosis subsequent to pulp canal obliteration from trauma of permanent incisors. J Endod 1996; 22:557–60.
10. Rotstein I, Engel G. Conservative management of combined endodontic-orthodontic lesion. Endod Dent Traumatol 1991; 7:266–9.
11. Levander E, Malmgren O. Evaluation of the risk of root resorption during orthodontic treatment: a study of upper incisors. Eur J Orthod 1988;10:30–8.
12. Brady J, Lewis DH. Internal resorption complicating orthodontic tooth movement. Br J Orthod 1984;11:155–7.
13. Patel S, Dawood A. The use of cone beam computed tomography in the management of external cervical resorption lesions. Int Endod J 2007;40:730–7.
14. Pace R, Giuliani V, Pagavino G. Mineral trioxide aggregate in the treatment of external invasive resorption: a case report. Int Endod J 2008;41:258–66.
15. Velvart P, Ebner-Zimmermann U, Ebner JP. Comparison of papilla healing following sulcular full-thickness flap and papilla base flap in endodontic surgery. Int Endod J 2003; 36:653–9.
16. Bortoluzzi EA, Araújo GS, Guerreiro Tanomaru JM, Tanomaru-Filho M. Marginal gingiva discoloration by gray MTA: a case report. J Endod 2007;33:325–7.
17. Lee SJ, Monsef M, Torabinejad M. Sealing ability of mineral trioxide aggregate for repair of lateral root perforations. J Endod 1993;19:541–4.
18. Ford TR, Torabinejad M, McKendry DJ, Hong CU, Kariyawasam SP. Use of mineral trioxide aggregate for repair of furcal perforations. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 1995;79:756–63.
19. Kogan P, He J, Glickman GN, Watanabe I. The effects of various additives on setting properties of MTA. J Endod 2006;32:569–72.
20. Sluyk SR, Moon PC, Hartwell GR. Evaluation of setting properties and retention characteristics of mineral trioxide aggregate when used as a furcation perforation repair material. J Endod 1998;24:768–71.
21. Torabinejad M, Chivian N. Clinical applications of mineral trioxide aggregate. J Endod 1999;25:197–205.
22. Ferris DM, Baumgartner JC. Perforation repair comparing two types of mineral trioxide aggregate. J Endod 2004;30:422–4.
23. Bortoluzzi EA, Souza EM, Reis JM, Esberard RM, Tanomaru-Filho M. Fracture strength of bovine incisors after intraradicular treatment with MTA in an experimental immature tooth model. Int Endod J 2007;40:684–91.
24. Bader HI. Treatment planning for implants versus root canal therapy: a contemporary dilemma. Implant Dent 2002;11:217–23.
25. Doyle SL, Hodges JS, Pesun IJ, Law AS, Bowles WR. Retrospective cross sectional comparison of initial nonsurgical endodontic treatment and single-tooth implants. J Endod 2006;32:822–7.