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Case Report

Orthodontically induced inflammatory root resorptions: a case report

Filho PFG, Letra A, Carvalhal JC, Menezes R. Orthodontically induced inflammatory root resorptions: a case report. © Blackwell Munksgaard, 2006.

Abstract – Orthodontically induced inflammatory root resorption is an unfortunate consequence of orthodontic movement. It is an adverse effect of an otherwise predictable force application. The degree of the inflammatory process depends on various factors such as amount of force, bone quality, aggressiveness of the resorbing cells and individual variation. Orthodontists should keep track of tooth movement both clinically and radiographically in order to detect any root resorptions and reevaluate the case. This case report presents the treatment outcome (4-year follow up) of five teeth with different and extensive inflammatory root resorptions following orthodontic treatment.

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Key words: inflammatory resorption; orthodontics; follow-up

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Orthodontic force application induces a local process that includes all of the characteristics of inflammation: redness, heat, swelling, pain, and to a small extent, inhibition of function (1). This inflammation, which is essential to tooth movement, is actually the fundamental component behind the process of root resorption (2).

Root resorption is a universal term that describes a pathological condition for which no etiologic component is engaged in the expression and so far a dental complication of maximum concern since it may lead to tooth extraction. Root resorption requires two phases: injury and stimulation (3, 4). In other words, the root surface and the cementum are damaged as a consequence of the injury and the subsequent inflammatory response (4). The injury may be mechanical following dental trauma, surgical procedures, and excessive pressure of impacted tooth or tumors, or chemical following irritation by bleaching agents or other irritants (5).

Exposed mineralized tissue is then colonized by osteoclasts, which initiate the resorption process. Nevertheless, without continuous stimulation of those cells, the process will end spontaneously. Repair with cementum-like tissue is likely to occur within 2–3 weeks if the affected surface is not very large. Perpetuation of the active resorption process depends on continuous stimulation of the osteoclasts and may occur by infection or pressure (6).

Although the outcome is frequently similar, orthodontically induced inflammatory root resorption is distinct from other types of root resorptions. It is an extremely complex, sterile inflammatory process; composed by various disparate components including forces, tooth roots, bone, cells, surrounding matrix, and certain known biological messengers. It is therefore not surprising to find terms such as individual susceptibility, genetics, and systemic factors being discussed when damage is evident after otherwise successful orthodontic treatment (7–10).

Orthodontics is probably the only dental specialty that relies on an inflammatory process intentionally as a means of solving functional and esthetic problems. The extent of the inflammation depends on factors such as aggressiveness of the different resorption cells, vulnerability, and sensitivity of the tissues involved, and amount of force applied. However, certain aspects such as individual vari-

ation regarding intensity of inflammation remain beyond our understanding (11).

This case report presents a 4-year follow up of five teeth with different and extensive root resorptions caused by excessive forces during orthodontic treatment.

Case report

A 30-year-old caucasian female was referred to the Department of Endodontics, School of Dental Medicine, Gama Filho University, Rio de Janeiro, Brazil, for evaluation and treatment of the maxillary incisors. The patient complained of excessive mobility of the teeth. Routine examination of full mouth radiographs revealed extensive horizontal root resorption in the maxillary incisors, external cervical root resorption in the maxillary left canine, and no apical radiolucencies (Fig. 1). The maxillary left lateral incisor and canine responded negatively to pulp vitality tests, while the other teeth responded positively in a normal vital pulp range.

The patient related that she had undergone orthodontic treatment for 20 years. With a rubber dam in place, access openings were made in the non-vital teeth and conventional cleaning and shaping procedures initiated. Canals were irrigated with 5.25% sodium hypochlorite throughout the procedures, filled with calcium hydroxide/sterile saline paste and sealed temporarily with ZOE (SS White, RJ, Brazil).

The patient returned 2 weeks later and obturation followed by lateral condensation with guttapercha (Dentsply, Petrópolis, RJ, Brazil) and Sealer 26 (Dentsply, Petrópolis, RJ, Brazil). One week after, periradicular surgery was carried out to debride the external cervical resorption in the canine. The resorption cavity was sealed with mineral trioxide aggregate (ProRoot, Dentsply-Maillefer, Ballaigues, Switzerland). The patient was told about the poor prognosis of the teeth and the importance of the follow-up visits, and advised to return every 6 months for a new evaluation.

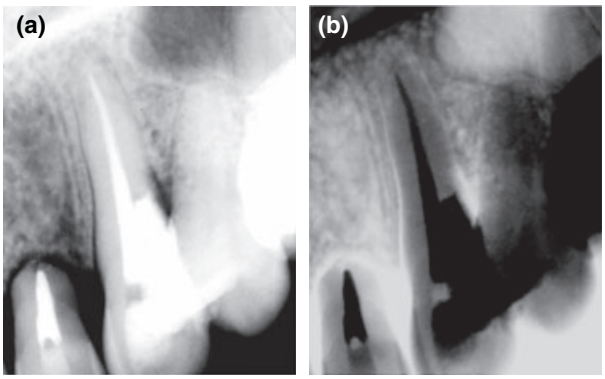

Fig. 2. (a) Radiographic control – 2 years. (b) Negative view.

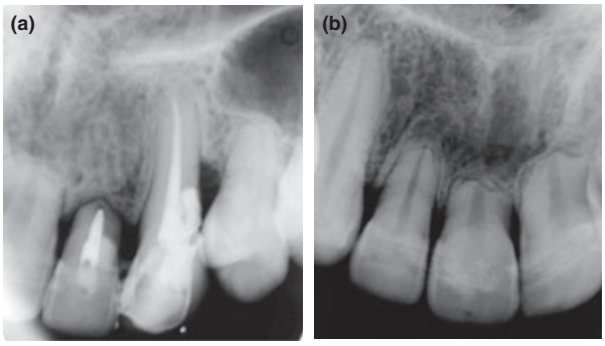

Fig. 3. (a) Left lateral incisor demonstrating severe bone loss. (b) Central and right lateral incisors and canine are still vital after 4 years.

The patient was referred to the Restorative Dentistry Department to have the access openings restored with resin and splinted with Ribbond (Ribbond, CA, USA). After 2 years of follow up, there were no signs of inflammation and the resorptions seemed latent (Fig. 2).

After 4 years, the clinical and radiographic situation remained the same (Fig. 3). No edema or sinus tract was detected. The left lateral incisor presented extense bone loss and is probably held in place by the immobilization and adjacent soft tissue. Although the left canine presented extense bone loss

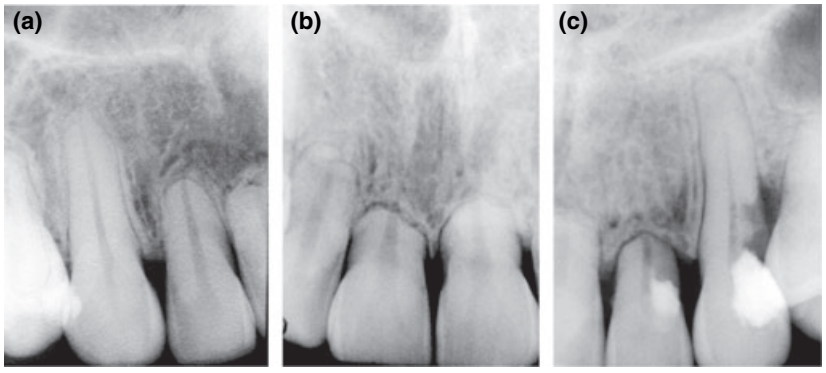

Fig. 1. Initial radiographs. Note severe horizontal root resorption in maxillary incisors and external root resorption on left canine.

distally, it showed very little mobility. The other teeth still presented vital pulps even in the presence of the root resorptions and moderate mobility.

Discussion

The reasons for root resorptions following orthodontic procedures can be considered multifactorial. One of the factors may be hypofunction of the teeth during normal occlusion (12). Sringkarnboriboon et al. (13) reported that the amount of root resorption was significantly greater in teeth with a hypofunctional periodontium, suggesting that orthodontic movement of non-occluding teeth should be performed with caution. Another important factor is the amount of force applied. Extremely heavy forces should always be avoided, since they have been shown to produce great resorptive activity (14). The exact reason for the root resorptions presented in this case report are not very well defined, but the fact that the patient had been in active orthodontic treatment for 20 years caused us to suspect poor treatment planning as well as failure in detecting the ongoing resorption process.

No orthodontic force can imitate the natural harmless physiologic force (15). In that manner, it is still impossible to point out an appliance or force system that will reduce or prevent orthodontically induced root resorption (16, 17).

Orthodontic patients (and parents or guardians) should be clearly informed that there is a real possibility of one or more teeth undergoing root resorption during orthodontic therapy. They should sign an information and consent form arranged by the dentist that shows that they understand the risks before treatment begins. However, this concerns individual variations to force application and tooth movement and not necessarily application of excessive forces.

According to Fuss et al. (6), apical root resorption is a complication of orthodontic treatment, with injury originating from the pressure applied to the roots during tooth movement. Continuous pressure stimulates clast cells in the apical third of the roots, and resorption may lead to significant shortening of the root, with no signs of radiolucency. Teeth are usually vital and asymptomatic unless the pressure applied is high enough to disturb the apical blood supply. The treatment of choice is removal of pressure, which should cease the resorption process and no further endodontic procedure would be necessary. Frequent radiographic examinations are extremely important throughout orthodontic therapy in order to detect any resorption.

The need for endodontic treatment in teeth presenting root resorptions due to excessive forces will depend on the extent of the damage on the affected roots and pulpal vitality (18). Resorption may, ultimately, result in loss of the teeth. However, with appropriate treatment, the prognosis for these teeth can be greatly improved, with the possibility of arresting or even preventing resorption.

There is some controversy among dentists regarding the need for endodontic treatment in vital teeth with more than 2/3 of the root resorbed. In the present case, endodontic treatment was performed solely on the maxillary left lateral incisor and canine, since the other affected teeth presented vital pulps. As part of our routine treatment in necrotic dental pulps, an intracanal dressing with a calcium hydroxide paste was placed in the root canal at least once to eliminate possible bacteria remaining in the root canal system, which could impair the repair process.

External cervical resorption is actually considered a progressive inflammatory reaction, of unclear etiology, also being called invasive resorption. It usually begins immediately below the epithelial insertion and its treatment is troublesome, due to the close proximity to the periodontal sulcus, which may perpetuate the inflammatory process. The diversity in treatments referred to in the current literature reinforces the inexistence of an ideal treatment (19–21). As adequate control of the sulcus is unlikely, removal of granulation tissue from the resorption lacuna and sealing are necessary for repair (6). Due to the extensive cervical resorption on the maxillary left canine, periradicular surgery was carried out to debride the resorption area, which was sealed with mineral trioxide aggregate, for its excellent biological properties and sealing ability, even in the presence of humidity or blood (22).

It could be that the patient in this case expressed a certain individual susceptibility to a resorption process thereby triggered by conventional orthodontic movement. However, her previous dental history seemed not to justify this hypothesis. We provided an emergency therapy that has fortunately allowed the patient to maintain her natural teeth for 4 years so far. No inflammatory signs were visible at routine examination after this period. All teeth still presented some mobility especially the maxillary left lateral incisor, being supported by the adjacent gingival tissue. However, the patient understood the limitations of the treatment and yet was satisfied with the esthetics of her natural teeth. We decided to maintain the immobilization with Ribbond to provide more comfort.

It's advisable that orthodontists keep track of tooth movement clinically and radiographically, through full mouth radiographs at regular intervals throughout the period of tooth movement. If root resorptions of any kind are detected, a decision must be made as to whether to continue, modify or discontinue the treatment.

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