Editorial

Root Resorption: The Silent Pathology

Root resorption (RR) is either a physiologic or pathologic condition associated with tooth structure loss as a result of clastic cells activities.[1] It might occur as a physiologic or pathologic phenomenon. Root resorption in the primary dentition is a normal physiologic process except, when the resorption occurs prematurely.[2] The initiating factors involved in physiologic root resorption in the primary dentition are not completely understood, although the process appears to be regulated by cytokines and transcription factors that are similar to those involved in bone remodeling.[3]

Permanent RR is invariably a local pathologic condition caused by orthodontic treatment, traumatic dental injury, apical periodontitis, intracoronal bleaching, autotransplantation, dentigerous cyst, neoplasia or idiopathic factors.[4] Unlike, bone that undergoes continuous physiologic remodeling throughout life, root resorption of permanent teeth does not occur naturally and is invariably inflammatory in nature. Thus, root resorption in the permanent dentition is a pathologic event; if untreated, this might result in the premature loss of the affected teeth.

RR might be broadly classified into external or internal resorption by the location of the resorption in relation to the root surface.[4] The external or internal superficial protective cell layer might be damaged, and inflammatory or replacement RR might affect any part of the root.[5] Internal root resorption has been reported as early as 1830. Compared with external root resorption, internal root resorption is a relatively rare occurrence, and its etiology and pathogenesis have not been completely elucidated.[6] Nevertheless, internal root resorption poses diagnostic concerns to the clinician because it is often confused with external cervical resorption (ECR). Incorrect diagnosis might result in inappropriate treatment in certain cases.[7]

Several aspects of inflammatory root resorption (IRR), such as prevalence, etiologic factors, and classification based on dental surface, progression, extension and pathologic mechanisms, have been extensively discussed.[8,9] However, IRR is an asymptomatic lesion that is difficult to diagnose and treat.[4] The criterion standard for the diagnosis of IRR is microscopic analysis,[9] and IRR might be classified as active, arrested or repaired according to microscopic findings. The prevalence of each stage affects prognosis and treatment.[4]

Invasive cervical resorption (ICR) is a type of external resorption that begins below the epithelial attachment. It commonly affects mineralized tissues (cementum and dentin), and except for some advanced stages, the predentin layer protects the pulp tissue because it is less mineralized. Heithersay[10] established a clinical classification of ICR based on intensive research studies, observing possible causes for this pathology as well as different therapeutic approaches to treat this condition.

Even though the etiology remains partially unclear, it seems that trauma, orthodontic treatment and tooth-whitening procedures are the main causes for ICR. Recently, von Arx et al[11] discussed the possible role of a feline herpes virus (FHV-1) as an etiologic cofactor in the development of multiple cervical resorption cases in humans.

Although root cementum in the surface of the radicular dentin prevents it from being resorbed, damage to it as a result of any of the aforementioned causes may expose root dentin to osteoclasts, therefore, initiating the resorptive process.[12,13] For the most invasive type of resorption as established by Heithersay,[10] treatment is more likely to be tooth extraction because of the extent of the lesion and the risk of failure.

Conventional radiographic images are frequently used to detect and follow-up IRR.[4] However, apical shortening, lateral or cervical root gaps, enlargement of root canal and external root radiolucencies are not detectable on radiographs at their early stages, when they are small, or because of limitations of this two-dimensional method. The diagnosis and extent of the lesion are hard to evaluate with conventional X-ray films.

Imaging techniques with greater angular differences between baseline images are likely to improve the performance. Cone beam computed tomography (CBCT) is used to further assess the defect and, therefore, to be able to make a correct diagnosis.[14,15] Only by means of this tomography is the extent of the resorptive defect accurately assessed in the three spatial levels.

High-resolution three-dimensional images have improved dental diagnoses.[15,16] Several studies have investigated the possibility of accurately detecting dental lesions on tooth surfaces and the periapical area by using CBCT.[17,18] Some studies reported on the accuracy and diagnostic performance of CBCT scans to detect IRR in comparison with conventional radiographs.[18]

To date, root canal treatment remains the only treatment of choice with teeth diagnosed with RR. Because the resorptive defect is the result of an inflamed pulp and the clastic precursor cells are predominantly recruited through the blood vessels, controlling the process of internal root resorption is conceptually easy, via severing the blood supply to the resorbing tissues with conventional root canal therapy. Early detection and a correct differential diagnosis are essential for successful management of the outcome of internal resorption to prevent overweakening of the remaining root structures and root perforations. The advent of CBCT no doubt has improved the clinician's diagnostic capability for internal root resorption. Nevertheless, internal

root resorption is often asymptomatic, and painful symptoms do not appear until an advanced stage of the lesion. Thus, the clinician's ability to detect this pathologic entity must rely heavily on the use of radiographs in routine oral examinations.

On the other hand, root canal therapy is often necessary in advanced resorption stages not only because of the resorption extent but also because the tooth may develop pulp necrosis and chronic apical periodontitis as a result of the trauma or contamination. Treatment should be directed to removing soft tissue within the resorptive defect and restoring it with a permanent filling material.

Finally, as the concept of pulpal regeneration becomes a foreseeable reality, it is prudent to elaborate on whether such a treatment strategy might be adaptable for the management of teeth with internal root resorption. There are similarities and differences between the currently achievable status of pulpal revascularization and the replacement form of internal root resorption. Hopefully, advances in different scientific disciplines will enlarge the horizon of ideas for future therapeutic strategies, apart from conventional root canal therapy, in the treatment of internal root resorption…

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