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Multiple idiopathic external and internal resorption: Case report with cone-beam computed tomography findings

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ABSTRACT

Root resorption is loss of dental hard tissue as a result of clastic activities. The dental hard tissue of permanent teeth does not normally undergo resorption, except in cases of inflammation or trauma. However, there are rare cases of tooth resorption of an unknown cause, known as "idiopathic root resorption." This report would discuss a rare case of multiple idiopathic resorption in the permanent maxillary and mandibular teeth of an otherwise healthy 36-year-old male patient. In addition to a clinical examination, the patient was imaged using conventional radiography and cone-beam computed tomography (CBCT). The examinations revealed multiple external and internal resorption of the teeth in all four quadrants of the jaws with an unknown cause. Multiple root resorption is a rare clinical phenomenon that should be examined using different radiographic modalities. Cross-sectional CBCT is useful in the diagnosis and examination of such lesions. (***Imaging Sci Dent 2014; 44: 315-20***)

KEY WORDS: Cone-Beam Computed Tomography; Endodontics; Tooth Resorption

Root resorption is the loss of dental hard tissue as a result of clastic activities.[1] The dental hard tissue of permanent teeth does not normally undergo resorption. The classification of root resorption plays an important role for the clinician in the processes of diagnosis and treatment planning. Tooth resorption may be described according to location as internal or external resorption. External root resorption can be further classified into surface resorption, external inflammatory resorption, external replacement resorption, external cervical resorption, and transient apical breakdown.[2] Some local factors cause external resorption, such as impacted teeth, orthodontic treatment, tumors and cysts, luxated or reimplanted teeth, periradicular inflammatory lesions, periodontal disease, and tooth bleaching. Systematic disorders including hypoparathyroidism, hyperparathyroidism, calcinosis, Turner's syndrome, Gaucher's disease, and Paget's disease have also been reported as the causative factors of external root resorption.[3]

Internal root resorption can be classified into internal inflammatory resorption and internal replacement resorption.[4] Although the etiology and pathogenesis of internal resorption is not fully understood, it is generally caused by chronic infection or trauma,[5] and radiographically, internal resorption appears as a well-demarcated, round-to-oval radiolucent widening or ballooning out of the pulpal root canal that is continuous with the walls of the canal itself on the radiograph.[2,6]

There are also some rare cases of tooth resorption of an unknown cause that do not fit into any of the above categories; they are usually named "idiopathic root resorption."[7]

Two types of idiopathic root resorption have been observed: apical and cervical. Cervical root resorption begins at the cervical area of a tooth and progresses towards the pulp, whereas apical root resorption affects the apical portion of the tooth root and causes gradual shortening.[8] The

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Fig. 1. Panoramic image shows multiple instances of idiopathic internal and external root resorption.

most common clinical feature of idiopathic root resorption is that patients are generally asymptomatic with an occasional complaint of tooth mobility. Indeed, resorptive defects are generally found coincidentally on routine radiographic examinations.[9] The locations of resorbed teeth in documented cases have been variable. Such defects have been reported to affect the posterior or anterior quadrants or all teeth.[10]

Radiographic diagnosis is essential to ensure correct treatment of the affected tooth. Conventional radiographs are frequently used to detect and follow root resorption.[1,4,7-9] However, apical shortening, lateral or cervical root gaps, enlargement of root canals, and external and internal root radiolucencies are typically not detectable on radiographs at an early stage (when they are small) or because of the limitations of this twodimensional method.[11,12]

Cone-beam computed tomography (CBCT) is a relatively new three-dimensional (3D) imaging modality requiring a significantly lower radiation dose than conventional computed tomography (CT). Endodontic applications of CBCT include the diagnosis of periapical lesions due to pulpal inflammation, the identification and localization of internal or external resorption, the detection of vertical root fractures, the visualization of accessory canals, and assessment of the causes of non-healing endodontically treated teeth. The detection and management of internal and external root resorption can be a challenging task and one for which CBCT is well suited.[13]

The treatment choice should be pulpectomy in the case of an internal resorption detected radiographically. If the resorption has not led to a large defect in the tooth structure, the resorption can be stopped by an endodontic treatment.[14]

In general, when the cause of external resorption is known, it can be treated by removing the etiologic factor(s).[3] The prognosis is excellent if the condition is managed early before any significant loss of tooth structure occurs; however, if the resorption is dismissed, the prognosis is poor. Internal and external resorption represents different pathologic processes that require different treatment protocols; therefore, accurate diagnosis is necessary for excellent prognosis.[15]

In this report, we discuss a rare case of multiple idiopathic external and internal resorption in the permanent maxillary and mandibular teeth of an otherwise healthy 36-year-old male patient evaluated using periapical/panoramic radiography and CBCT.

Case Report

A 36-year-old male was referred to our outpatient clinic for discomfort in the left mandibular second molar under a crown bridge restoration; he experienced slight discomfort while chewing. There was no history of trauma, hospitalization, or medical, endocrine, or systemic disease. Hematological investigations, including a complete blood count and measurement of the calcium, phosphorus, and alkaline phosphatase levels, revealed values within the normal range.

A clinical examination showed no tenderness upon palpation of the labial tissues over the periapical region of any tooth. There was no tenderness to percussion; however, the patient felt discomfort while chewing with the left mandibular second molar. There was no evidence of adenopathy, paresthesia, or motor nerve deficiency in the head and neck area. A clinical examination revealed moderate oral hygiene and healthy gingival tissues. The mobility of the teeth was within the normal range. An intraoral

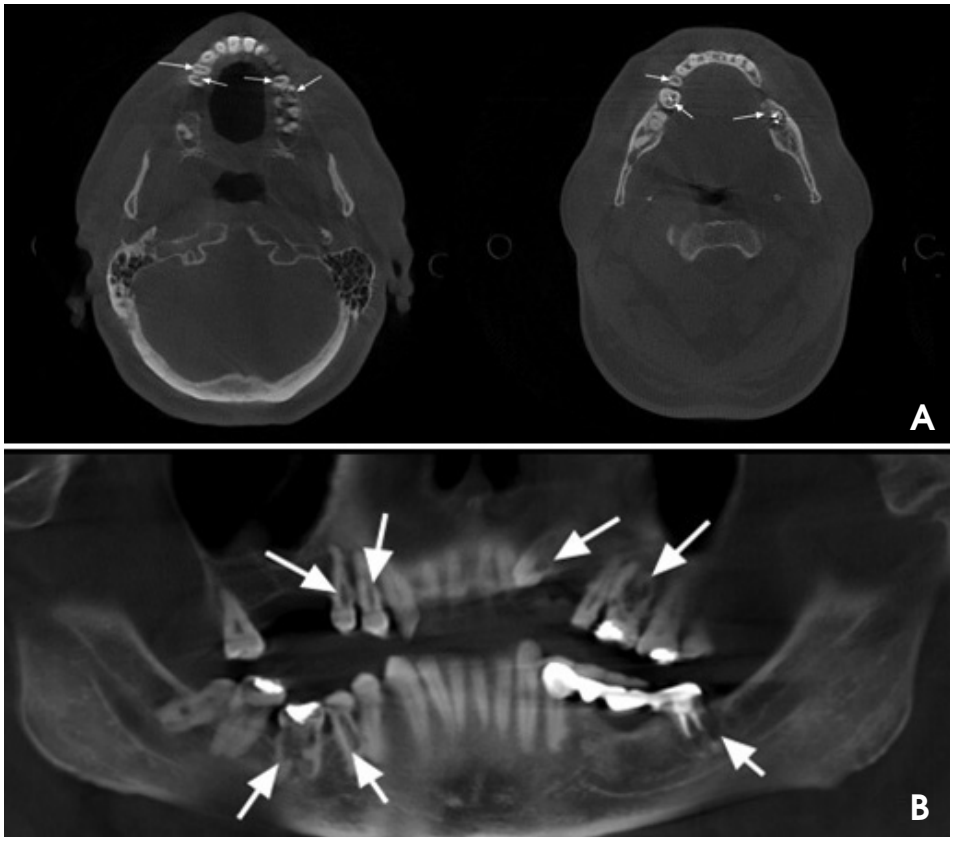

Fig. 2. A. Axial cone-beam computed tomographic images show sites of idiopathic resorption of the teeth. B. Panoramic reconstructed image clearly demonstrates the resorptive areas.

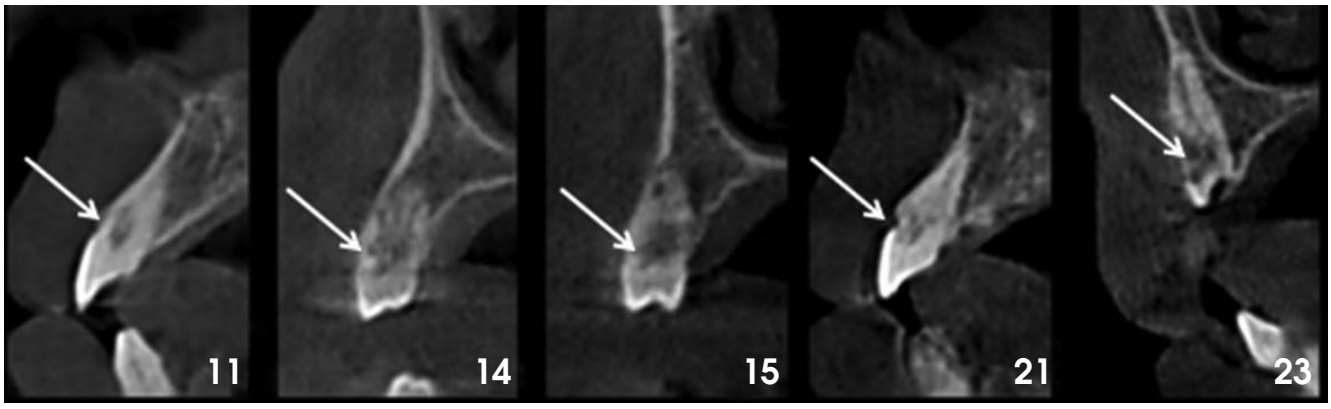

Fig. 3. Cross-sectional cone-beam computed tomographic images show external resorption in molar teeth (arrows).

examination also revealed that the patient was caries-free and had four amalgam restorations and a fixed bridge to replace lost mandibular premolars and molars.

All teeth except the bridge teeth were pulp-tested using a refrigerant spray and electrical pulp test, and all responded within normal limits. Periodontal probing was consistently 3 mm or less, and no bleeding on probing was detected.

Initially, a panoramic radiograph was taken. The radiograph showed evidence of resorption in several teeth, including the right maxillary central incisor, first and second premolars, left maxillary central and lateral incisors, second premolar, and first molar, and the unerupted left maxillary canine (Fig. 1). A decision was made to perform CBCT with 3D reconstruction to obtain a more precise location and definition of the pathological features of the resorption sites. CBCT was performed in all three dimensions - axial, sagittal, and cross-sectional - with a slice thickness of 1 mm by using a Promax CBCT scanner (Planme-

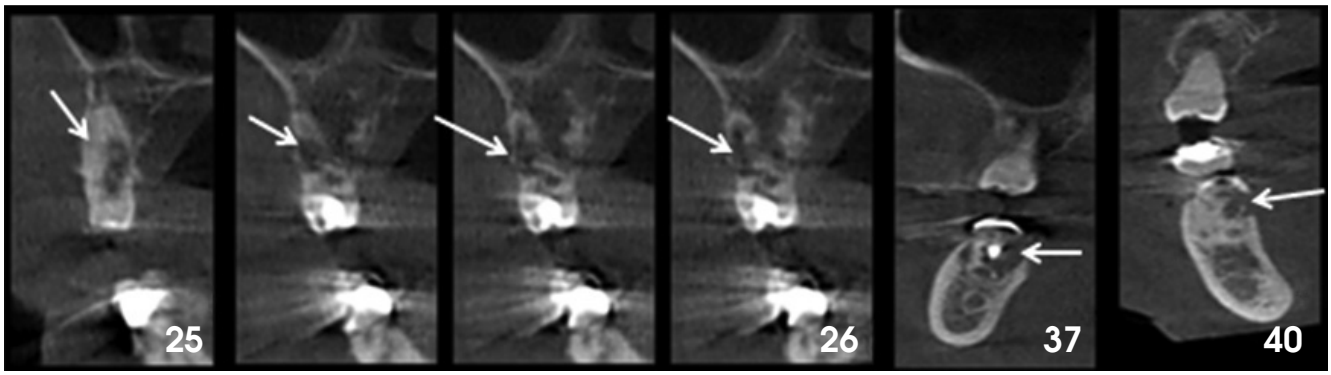

Fig. 4. Cross-sectional cone-beam computed tomographic images show internal resorption in molar teeth (arrows).

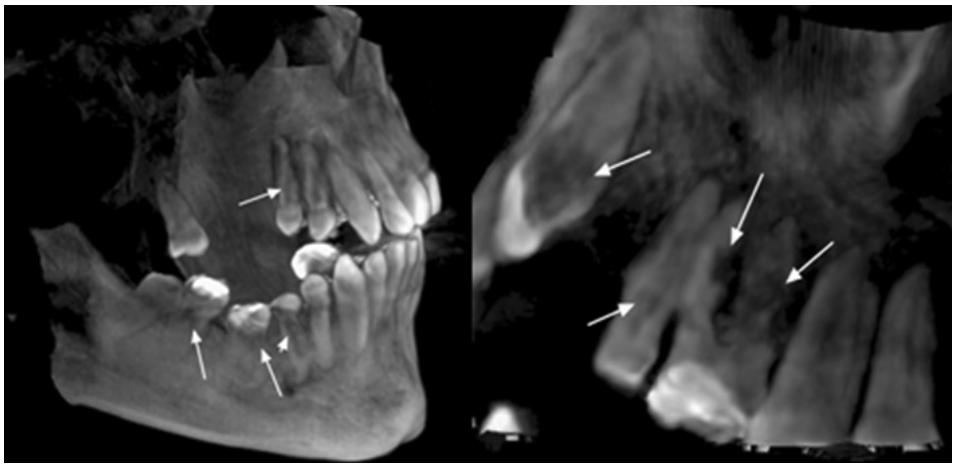

Fig. 5. Three-dimensional cone-beam computed tomographic volume rendering images clearly show external and internal resorption (arrows).

ca, Helsinki, Finland) together with 3D rendered images. The axial (Fig. 2A) and panoramic reconstructed images (Fig. 2B) of the left maxillary first molar clearly showed multiple resorptive areas. The cross-sectional images showed internal resorption of the teeth, including the right maxillary central incisor, first and second premolars, left central and lateral incisors, canine, and right mandibular second premolar (Fig. 3). Further, external resorption was found in the teeth, including the left maxillary second premolar, first molar, mandibular second molar, and right mandibular first molar (Fig. 4). The 3D rendered images were not sufficiently clear to detect the nature or extent of the external or internal resorption of the teeth (Fig. 5). Based on the diagnosis of multiple internal resorption from the panoramic and CBCT images, we decided to perform dental examinations of the patient's family members to assess multiple resorption because of the possibility of a hereditary influence. However, no clinical or radiographic examination could be performed because it was not possible to contact any of the family members. CBCT demonstrated that the lesions were generally larger than was evident from the periapical or panoramic films. No treatment was performed because the patient refused treatment.

Discussion

Root resorption of a tooth is a pathological process of internal or external origin. Internal resorption occurs when the natural protection of the predentin and odontoblasts in the root canal is damaged or removed due to the transformation of embryonic connective tissue cells into giant multinucleate odontoclasts. The internal aspect of the root canal is resorbed by activated multinucleate giant cells adjacent to the granulation tissue in the inflamed pulp. Teeth in which the resorptive process reaches the cervical area of the crown may have a pinkish color, and are known as "pink teeth," resulting from granulation tissue ingrowth.[1,16]

In contrast, external root resorption in multiple permanent teeth is a rare phenomenon. It occurs when the balance between osteoblastic and osteoclastic activities, which maintain the physiological state of the tooth root and bone,

is disturbed, resulting in the removal of the precementum and cementoblasts from the root surface.[10]

Resorption of the cementum, dentin, and/or enamel due to an unknown mechanism not depending on the conditions mentioned above, is called "idiopathic resorption." Idiopathic resorption in multiple roots is far rarer than resorption seen in one or two teeth, and it occurs in a different pattern from that seen in physiological resorption. Possible causes include microbiologically induced osteoclastic or chronic inflammatory activity, familial (genetic) disorders, occlusal trauma, orthodontic tooth movement, systemic disorders, and drug use.[8,10] It is thought that the process involves the destruction of dentin followed by the creation of a bony matrix within the resorptive cavity.[17] This case had no obvious etiological factor, so there might be a genetic component.

Multiple external resorption of permanent teeth is an uncommonly reported phenomenon. Further, certain idiopathic cervical root resorption cases have been reported.[10,18,19] Soni and La Velle[10] and Brooks[18] reported that maxillary teeth were more commonly involved in such cases than mandibular teeth. Lynch and Ahlberg[19] also observed the resorption of the upper first premolars.

Tooth resorption is a problem for dental practitioners, and early detection is important. Conventional radiographic images are frequently used to detect root resorption. However, apical shortening, lateral or cervical root gaps, enlargement of the root canal, and external root radiolucencies are typically not detectable on radiographs in the early stages when they are small or because of the limitations of this two-dimensional method. An alternative diagnostic tool for the early detection of root resorption is CBCT. It was used to detect root resorption in the present case report. Early detection can lead to timely intervention and better treatment outcomes. Root resorption extension is identified by analyzing all lesion dimensions; axial, transverse, and cross-sectional slices can be obtained using CBCT. Root resorption measurements, as part of a longitudinal follow-up, can determine whether the lesion is in a stage of arrest, repair, or progression. The most important advantage of this imaging modality is acquiring comparable images with much lower radiation doses than multiple-detector CT. In recent studies, it has been concluded that the scans produced by CBCT are more accurate than periapical radiographs and are an effective and safe way to detect both horizontal and vertical root fractures. It has also been concluded that CBCT should be considered when conventional radiographic techniques fail to provide information for the diagnosis.[20-22]

Although in the present case the initial diagnosis demonstrates that CBCT was superior in diagnostic efficacy to panoramic imaging with respect to the localization of the extension of the fibrous dysplasia because of the many affected bones through the skull, CBCT should not necessarily replace panoramic images for following-up the maxillary sinus region after surgery because it involves greater radiation exposure (4-20 times greater). From the standpoint of radiation risk, CBCT appears to involve 3-7 times the dose of a panoramic examination, depending on the area examined, the degree of collimation, and the acquisition software. Thus, the decision to select an imaging modality for diagnostic purposes should be based on the expected diagnostic yield and in accordance with the "as low as reasonably achievable" principle.[20,21]

In conclusion, our report presented a case of multiple root resorption, which was a rare clinical process that should be examined using different radiographic modalities. Cross-sectional and axial CBCT images would be useful in the diagnosis and assessment of such lesions.

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