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Letter to the editor

Management of root resorption in dentistry

Root resorption is a pathological process that mainly leads to progressive tooth destruction, particularly the loss of root dentine and cement. This process may occur on the inner or outer surface of the root. The exact etiology and pathogenesis of root resorption (RR) are not clear. However, the key RR factors that can affect tooth structure are trauma, pulp infection, tooth bleaching, and orthodontic therapy. Regardless of its localization, RR is irreversible and can lead to discomfort for the patient, tooth discoloration, tooth mobility, and other conditions. In this respect, accurate diagnosis and treatment of RR is often a challenge for clinicians.[1] This brief letter focuses on root resorption in dentistry.

Trauma and pulp necrosis are major factors causing internal root resorption (IRR). In this context, a study reported cervical IRR in tooth No. 41 in a 36-year-old woman. The study recommended the following procedures for a successful outcome: 1) rinsing the canal with 2.6% NaOCl, 2) dressing the canal with $Ca(OH)_2$, 3) removing $Ca(OH)_2$ after 3 weeks through ultrasonic activity, and 4) filling the canal with gutta-percha and Endoseal MTA by using warm vertical compaction. Based on the obtained results, $Ca(OH)_2$ as temporary filling material can cease IRR in the case of trauma and pulpal inflammation.[2]

To evaluate the effect of 5% and 10% glycolic acid solutions for $Ca(OH)_2$ removal from simulated IRR, Keskin et al. performed the following procedures on 170 maxillary second premolar teeth: 1) preparing the canals using Reciproc R50, 2) splitting the roots into halves and preparing a simulated IRR, 3) filling the root canals with $Ca(OH)_2$, 4) using K-File No. 15 to create space for inserting an irrigation needle, and 5) using 5% glycolic acid, 10% glycolic acid, 17% EDTA, 10% citric acid, and distilled water with activated ultrasonic or without for removing $Ca(OH)_2$. The results showed that 10% glycolic acid in combination with passive ultrasonic irrigation significantly removed $Ca(OH)_2$ from IRR compared to other solutions. Thus, a 10% glycolic acid solution can be regarded as an alternative final rinsing solution in the case of RR.[3]

Another study evaluated the efficacy of several techniques in $Ca(OH)_2$ removal from simulated IRR cavities in 70 mandibular premolar teeth. The samples were divided into seven groups ($n = 10$), and the $Ca(OH)_2$ was removed as follows: 1) conventional syringe irrigation, 2) passive ultrasonic irrigation, 3) EndoActivator, 4) XP-Endo finisher file, 5) Er,Cr:YSGG, 6) photon-induced photoacoustic streaming (PIPS), and 7) shock wave-enhanced emission photoacoustic streaming (SWEEPS). Based on the results, PIPS and SWEEPS were superior in removing $Ca(OH)_2$ than other techniques. Therefore, applying PIPS and SWEEPS is recommended for removing temporary filling material from IRR.[4]

Consistent with previous studies, a case report described the reparative endodontic treatment of tooth No. 22 as follows: 1) detecting extensive IRR with lateral perforation and radiolucency, 2) disinfecting only the coronal part of the tooth with 3% NaOCl + ultrasonic activation after access cavity, 3) dressing $Ca(OH)_2$ only to resorptive tissues for two weeks, 4) replacing $Ca(OH)_2$ again, 5) removing $Ca(OH)_2$ with ultrasonically activated 3% NaOCl after 6 weeks, 6) provoking bleeding through the MicroOpener in the canal, and 7) using MTA on the blood clot and resorptive tissues, and filling the tooth with composite. According to the obtained results, the reparative treatment stops the IRR process and stimulates dental hard tissue, even in the perforation area. Selecting the appropriate technique is the key factor for removing $Ca(OH)_2$ and managing IRR in each case.[5]

Cervical root resorption is another complication during internal bleaching of teeth. In this respect, Zarean et al. assessed MTA, CEM cement, and Biodentine as coronal plug during internal bleaching. To this end, a total of 60 single-canal incisors, including three experimental groups ($n = 16$), a positive control group ($n = 6$), and a negative control group ($n = 6$), were chosen. Afterward, the following interventions were performed: 1) preparing the canals (three experimental groups and a positive control group) and filling with a later condensation technique, 2) sealing the coronal third of canals in experimental groups

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with MTA, CEM cement, and Biodentine, 3) bleaching 54 samples three times in a 72-h interval, and 4) contaminating samples with *Enterococcus faecalis*. The results showed that the penetration rates of bacterial microleakage were 75%, 68.75%, and 56.25% for Biodentine, MTA, and CEM cement, respectively. Although more investigation is required in this regard, CEM cement showed promising results with its sealing properties to reduce cervical RR in the case of internal bleaching.[6]

Orthodontic treatment is a risk factor for RR. In this regard, Ito et al. evaluated the risk of external RR with orthodontic treatment using CT texture analysis. The study included 16 patients who were treated with a fixed orthodontic appliance (i.e., before and after orthodontic surgery). The results showed the efficiency of CT texture analysis in the quantitative RR assessment of maxillary central incisor roots. Thus, CT texture analysis is considered a novel approach that can be utilized for preceding RR.[7]

Obturation technique is also a challenge for clinicians in the case of IRR. In this perspective, the results of two relevant studies are as follows: 1) In the first study, four obturation techniques (i.e., cold lateral compaction, core-carrier system (GuttaCore), injectable cold filling (GuttaFlow® BioSeal), and continuous wave obturation system) were investigated in 80 replicas with IRR. After micro-CT evaluation, the results showed that GuttaFlow and the injectable continuous wave obturation system (Elements Free) could fill the IRR more effectively than other systems. 2) In the second study, five obturation techniques were evaluated in the case of IRR: warm vertical compaction, lateral condensation, Obtura II with System B, E and Q plus (Meta Dental Corp) with System B, and Thermafil. The results of the study revealed that Obtura II with System B has the highest percentage of filling material and the fewest voids in the samples. Thus, selecting an appropriate obturation technique plays a pivotal role in the treatment of IRR.[8,9]

The results of the investigation showed that filling IRR with EndoSequence® Root Repair MaterialTM (RRM) provides more strength to the fracture resistance of teeth and can increase the success rate of the outcome in the case of RR.[10] Based on the information provided in this brief letter the following procedures should be considered in the case of RR: 1) using $Ca(OH)_2$ as temporary filling, 2) using 10% glycolic acid for final rinsing, 3) removing $Ca(OH)_2$ with PIPS, SWEEPS, and 10% glycolic or NaOCl + ultrasonic activation, 4) using CEM cement as a coronal plug in internal bleaching, 5) evaluating RR through CT texture analysis, 6) selecting appropriate obturation techniques (e.g., GuttaFlow, Elements Free, and Obtura II with System B), and 7) filling the IRR with MTA or RRM. Therefore, clinicians' ability to analyze radiographic examination, diagnosis, and select treatment strategies is indispensable for enhancing the successful outcome of RR.

Declaration of competing interest

The authors have no conflicts of interest relevant to this article.

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