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CLINICAL REPORT

Treatment and esthetic management of traumatized maxillary central incisors with endodontic therapy and the inside/outside bleaching technique: A clinical report

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ABSTRACT

Traumatic dental injuries most commonly occur to the maxillary central incisors, occasionally resulting in tooth discoloration and prompting affected patients to seek dental treatment. Other negative sequelae of trauma to teeth include root resorption that can complicate definitive treatment planning to manage discoloration. This article describes the conservative esthetic management of discolored traumatized teeth through the inside/outside bleaching technique after endodontic therapy for external inflammatory root resorption. (J Prosthet Dent 2019;122:343-7)

Traumatic dental injuries can lead to negative consequences for the teeth involved, including pulp necrosis, ankylotic root resorption, inflammatory root resorption, and pulp canal obliteration.[1] In addition, trauma can cause discoloration of teeth by rupturing the intrapulpal blood vessels and releasing blood components into the dentinal tubules.[2] If the pulp becomes necrotic, the discoloration may remain and worsen over time.[2] Pulpal hemorrhage may be apparent through dentin and enamel as a gray discoloration of the dental crown.[3] The maxillary central incisors are the teeth most commonly affected by trauma.[4]

External inflammatory root resorption (EIRR) represents the most common type of external resorption and is most commonly caused by trauma, particularly with pulpal necrosis.[5] EIRR is further subdivided according to the location of the resorption on the tooth, either the cervical or apical region.[6] Typically, with EIRR at the root apex, a persistent and progressive radiolucency is found adjacent to the region of root resorption.[5,6] The process is normally asymptomatic, and a draining fistula may be observed near an adjacent tooth.[7] As the apical periodontitis progresses, the apical root resorption causes shortening of the apical root to one-third of the involved root or roots, which may or may not be resolved after conventional root canal therapy (RCT).[7]

For patients with discolored endodontically treated teeth, intracoronal bleaching is a conservative esthetic treatment that may postpone the need for additional restorative treatment[4] and maintain the natural tooth structure.[8] However, external resorption of the cervical crown and root structure may be associated with bleaching endodontically treated teeth,[9] particularly where high concentrations of hydrogen peroxide (30%) in combination with heat were used.[10] The authors are unaware of reports of the development of invasive cervical resorption when low concentrations of hydrogen peroxide, such as 3.5% released from 10% carbamide peroxide (CP), are used or when hydrogen peroxide is used without heat.[11]

This clinical report describes the treatment with RCT of 2 necrotic maxillary central incisors affected by EIRR secondary to trauma and then managed esthetically with the inside/outside bleaching technique with 10% CP, as described by Settembrini et al.[12]

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A 52-year-old Asian woman presented to the Dental College of Georgia at Augusta University Faculty Practice clinic with the chief complaint of "my teeth are dark."

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Figure 1. Initial presentation of patient with discolored maxillary central incisors.

The patient's maxillary central incisors presented with a grayish-black appearance (Fig. 1).

The patient's medical history included prediabetes and gastroesophageal reflux disease. She reported no history of dental trauma that she could recall and no previous orthodontic treatment. A draining sinus tract was present at the apical area of the right maxillary central incisor. An esthetic analysis revealed an average smile line[13] and crowding of the anterior teeth, with discolored class III composite resin restorations present on the mesial surfaces of the maxillary central incisors. The patient had an Angle class I molar occlusal relationship bilaterally and presented with no active carious lesions and moderate extrinsic staining. Radiographically, generalized moderate horizontal bone loss was apparent with generalized short roots. In the area of the maxillary central incisors, the roots appeared very short with the presence of periapical radiolucencies (Fig. 2). No mobility was noted. Periodontal probing revealed probing depths of 2 to 3 mm in the anterior region, 4 to 5 mm in the posterior region, and a localized area of 6 to 7 mm in the mandibular right molar area where she reported food packing. She was referred to an endodontist (L.F.S.) to address the draining sinus tract and periapical radiolucencies on the maxillary central incisors and to a periodontist to address the increased probing depths in the posterior region.

An endodontic evaluation with pulp testing revealed necrotic pulps in both maxillary central incisors, with percussion and palpation both negative. The endodontic diagnoses were necrotic pulp with chronic apical abscess for the right maxillary central incisor and necrotic pulp with asymptomatic apical periodontitis for the left maxillary central incisor. Probing depths were within normal limits. After consultation with the restorative dentist (M.L.M.), the treatment options presented were nonsurgical RCT with bleaching or extraction of the teeth with future implants. The patient was advised that orthodontics would be needed to create space for implants

Figure 2. Initial presentation of patient with periapical radiolucencies and shortened roots from external inflammatory root resorption.

Figure 3. After root canal therapy with MTA obturation. Two-millimeter space left apical to orifices for cervical barrier placement. MTA, mineral trioxide aggregate.

because of the crowding of the maxillary anterior teeth. Because of the unfavorable root-crown ratio, the restorative option of crowns was not recommended. The patient chose the least expensive and least time-consuming option of RCT and bleaching.

The patient gave verbal and written consent for RCT on the maxillary central incisors. Local anesthesia was

Figure 4. After placement of cervical barrier. Chambers left unrestored for inside/outside bleaching.

Figure 6. After 1 week of external bleaching of all maxillary anterior teeth with 10% carbamide peroxide.

Figure 5. After 2 weeks of inside/outside bleaching with 10% carbamide peroxide.

Figure 7. Six months after endodontic therapy showing resolution of periapical radiolucencies.

administered, and a rubber dam (DermaDam; Ultradent Products, Inc) was placed. Access to the chambers was obtained, and the canal orifices were located under ×8 magnification. No cracks or accessory canals were noted under magnification. The canals were irrigated with 6.15% sodium hypochlorite. Gates Glidden drills #2 through #4 (Gates Glidden Drills; Dentsply Sirona) were used to flare the coronal aspects of the canals. A working length of 16 mm was established for both teeth using an apex locator (Root ZX II; Morita). The canals were instrumented using hand instruments intermittently with sodium hypochlorite. The right incisor was filed to #100, and the left incisor was filed to #70 (Ready Steel FlexoFile Files; Dentsply Sirona). The canals were dried, and calcium hydroxide paste (UltraCal XS; Ultradent Products, Inc) was placed in the canals. Cotton pellets were placed over the orifices, and an interim restoration (Tempit; Centrix) was placed in the access openings; the patient was given an appointment for 2 weeks later to complete the obturation.

At the obturation appointment, the patient was asymptomatic and the sinus tract was healed. Local anesthesia was administered, and a rubber dam was placed. Access to the canals was regained, which were then irrigated with sodium hypochlorite. The final sodium hypochlorite irrigation was performed with a true apical negative pressure system (EndoVac; Kerr Corp). The canals were obturated with mineral trioxide aggregate paste (Gray MTA Plus; Avalon Biomed). A space of 2 mm apical to the canal orifices was left for placement of a cervical barrier before internal bleaching (Fig. 3). The chambers were cleaned, and cotton pellets and interim restorations were placed in the access cavities. The patient was given an appointment with the restorative dentist for 1 month later.

At the appointment with the restorative dentist, the patient reported no symptoms. The interim restorations and cotton pellets were removed from the pulp

Figure 8. After replacement of existing defective and discolored class III restorations and definitive restoration of pulp chambers.

Figure 9. Fifteen months after restorative treatment.

Figure 10. Twenty-one months after endodontic therapy.

chambers. A 2-mm cervical barrier of resin-modified glass ionomer (Vitrebond Plus Light Cure Glass Ionomer Liner/Base; 3M) was placed in 2 increments and light polymerized for 20 seconds each. The pulp chambers were left unrestored (Fig. 4). A custom-made bleaching tray and 4 tubes of 10% CP gel (Opalescence PF 10%; Ultradent Products, Inc) were delivered to the patient. The patient was instructed to inject the bleaching gel into the open pulp chambers of the maxillary central incisors for the inside bleaching and into the bleaching tray in the central incisor wells for the outside bleaching. The patient was told to do this overnight, wearing the bleaching tray each night for 2 weeks, at which time she should return for evaluation.

After 2 weeks of inside/outside bleaching, the central incisors were slightly lighter than the other maxillary anterior teeth (Fig. 5). Cotton pellets and interim restorations were placed in the pulp chambers, and the patient was instructed to externally bleach all maxillary anterior teeth with 10% CP until shade equilibrium was achieved. The patient was pleased with the results after 1 week of external bleaching (Fig. 6). Six months after RCT completion, a periapical radiograph was made of the central incisors, and the periapical radiolucencies showed some resolution (Fig. 7). The cotton pellets and interim restorations were removed, along with the existing defective class III composite restorations on the central incisors. The teeth were etched with 37% phosphoric acid (Uni-Etch w/BAC; Bisco) for 30 seconds, a 2-step adhesive system was used (OptiBond FL; Kerr Corp), and restorations were completed with composite resin (Premise; Kerr Corp), shade B1 (Fig. 8).

The patient was evaluated at follow-up appointments 1 month and 15 months postoperatively (Fig. 9), and she expressed satisfaction with the results. Periapical radiographs made at 21 months (Fig. 10) after the endodontic treatment showed satisfactory healing of the periapical radiolucencies.

DISCUSSION

Teeth that present with short roots can pose a challenge when planning the treatment, and it is important to understand the etiology before commencing the treatment. The patient in this situation could not recall dental trauma that could have contributed to the short roots on the maxillary central incisors. Radiographic evaluation revealed short roots on all the patient's teeth, a trait that is more common in people of Asian descent.[14] However, the grayish discoloration of the teeth, presence of the draining sinus tract, necrotic pulp status of both central incisors, and the fact that maxillary anterior teeth are prone to trauma[15] led to the diagnosis of apical EIRR secondary to trauma. According to the American Association of Endodontics, teeth with apical external root

resorption associated with a tooth exhibiting pulp necrosis and apical pathosis have a favorable prognosis.[16] The use of mineral trioxide aggregate as an apical plug after nonsurgical RCT has been shown to induce apical hard tissue formation[17] and so was the choice for obturation in this situation.

After the pathology of the central incisors was managed endodontically, the chief complaint was addressed as conservatively as possible through bleaching. The inside/outside bleaching technique has been described as a practical, inexpensive, minimal-risk method of lightening nonvital teeth that requires fewer office visits than the walking bleach technique.[18] As described in the clinical report, the access was left unrestored, and the patient injected CP into the pulp chamber and bleaching tray and then seated the tray in the mouth, either overnight or for 1 to 2 hours at a time. The patient's desire to see improved results is often motivation to overcome any compliance or dexterity issues with injecting the CP into the chamber, and because the fresh bleaching material is continuously applied, the patient can see positive results in as few as 3 to 4 days.[12] This patient saw favorable results within 2 weeks, even with the severity of her tooth discoloration. An essential 2- to 3-mm protective barrier of resin-modified glass ionomer cement was placed over the root filling to prevent the percolation of hydrogen peroxide into the periodontal tissues.[11] The tooth shade was allowed to stabilize, and bond strengths were allowed to return to normal for at least 2 weeks before restoring the access and replacing the defective class III composite restorations.

SUMMARY

Because of the endodontic treatment and short roots of this patient's maxillary central incisors, the inside/outside bleaching technique offered a conservative, inexpensive, safe, and rapid solution to her chief complaint.

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