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Case Report

Successful treatment of a radicular groove by intentional replantation and Emdogain® therapy

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Abstract – Radicular groove is an anatomical malformation often predisposing to a severe periodontal defect. Treatment of such an anomaly presents a clinical challenge to the operator. Presented is a case of successful treatment of a radicular groove associated with a maxillary lateral incisor in a 15-year-old girl. A combination of endodontic, intentional replantation and Emdogain® therapy was used. At 1-year follow-up, the patient was comfortable and active healing was evident.

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The radicular groove is a developmental anomaly predominantly found on the lingual surface of maxillary lateral incisors (1, 2). It usually initiates at the level of the cingulum then extends along the root to varying lengths. The radicular groove has also been termed radicular lingual groove, cingulo-radicular distolingual groove, palato-gingival groove, and/or vertical developmental groove (2, 3). This defect may often harbor bacteria and debris leading to a local inflammatory reaction (3, 4). Once the epithelial attachment is breached, the inflammatory process progresses apically creating a self-sustaining periodontal defect. The prognosis of teeth with radicular grooves depends on the size and apical extension of the groove, the amount of remaining periodontal attachment, the nature of the associated endodontic lesion, the chronicity of the lesion, and plaque control (5).

Suggested treatment modalities were curettage of the affected tissues, elimination of the groove by grinding and/or by sealing with a variety of filling materials (4–6). If the groove extends beyond the middle-third of the root apex, surgical procedures are required, which include, among others, the use of barriers and/or intraosseous grafts to correct the defect (4, 7). Although, the defect is of periodontal etiology, endodontic treatment is often required because of secondary pulpal involvement. If periodontal breakdown continues, extraction of the affected tooth should be considered.

Recently, the use of enamel matrix derivatives was suggested as an alternative to barriers for treating infrabony periodontal defects (8, 9). In addition, several studies have indicated favorable results with the use of a commercially available enamel matrix derivative – Emdogain®. This product consists of hydrophobic enamel matrix proteins extracted from porcine developing embryonic enamel. In a histologic study in dogs, Iqbal & Bamaas (10) reported enhanced healing of the periodontal ligament in permanent incisors replanted with Emdogain®. Similar findings were reported by Hoshino (11) and Hamamoto et al. (12) suggesting that application of Emdogain® to transplanted and replanted teeth may enhance regeneration of the periodontal ligament, promote healing of root resorption, and prevent ankylosis. Filippi et al. (13) reported that Emdogain® may also prevent or delay ankylosis of intentionally replanted human teeth.

Presented is a case of a radicular groove in a maxillary incisor, associated with a large periradicular lesion, treated successfully with a combined endodontic, intentional replantation and Emdo-

gain® therapy. The rational for this treatment modality is also discussed.

Case report

A 15-year-old Hispanic female presented to our clinic complaining of a purulent discharge from her gingiva and bad mouth odor. Visual examination revealed a draining sinus tract on the labial gingival surface associated with the maxillary left lateral incisor. Thermal and electric pulp vitality tests were negative. A radicular palatal groove was detected extending from the crown to the gingival sulcus, creating a periodontal pocket of 13 mm in depth. Radiographs showed a large periradicular radiolucency associated with the affected tooth (Fig. 1). A diagnosis of pulp necrosis with suppurative apical periodontitis was established.

Endodontic therapy was completed in two sessions using a 5.25% sodium hypochlorite solution as an irrigant, and calcium hydroxide (Ultradent, South Jordan, UT, USA) as an 8-week interappointment canal dressing. Root canal obturation was completed with gutta-percha and Kerr EWT sealer (Kerr, Romulus, MI, USA). The access cavity was restored with composite resin (Dentmat, Los Angeles, CA, USA) and the patient was scheduled a week later; however, she showed up only after 3 months.

Fig. 1. Preoperative radiograph showing a large periradicular radiolucency associated with the maxillary left lateral incisor with a radicular palatal groove in a 15-year-old girl.

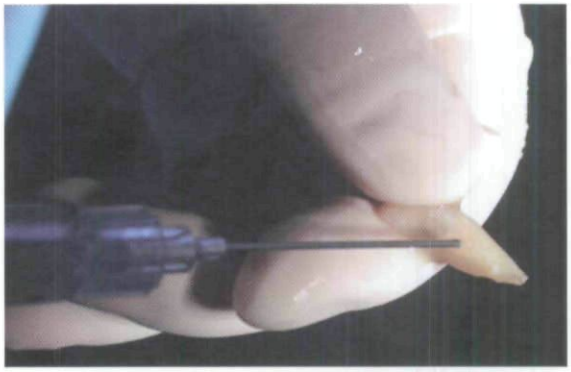

Fig. 2. Clinical view of the intentionally extracted tooth. Emdogain® is applied to the radicular groove and root surface prior to replantation.

At this time the tooth was intentionally extracted, verifying that the buccal and lingual cortical bone plates remained intact and placed in a sterile Hank's balanced salt solution (Save-A-Tooth®, Pottstown, PA, USA). The radicular groove was removed with a diamond bur and enamel matrix protein derivative (Emdogain®, Malmo, Sweden) was applied to the root surface with a plastic syringe (Fig. 2). The tooth was then replanted back into its alveolar bone and splinted with a semi-rigid splint for 8 weeks.

At 3-months recall, the sinus tract had closed and the patient was asymptomatic. At 1-year recall, signs of active periodontal healing were evident. Upon probing, no pockets extending beyond 3 mm were detected. Radiographically, a significant decrease in size of the apical radiolucency was noted (Fig. 3). The tooth remained asymptomatic, and the patient was comfortable.

Discussion

The treatment of a radicular groove presents a clinical challenge to the operator and must involve a multidisciplinary approach. The variability in size and shape of this anomaly coupled with bacterial invasion may affect both the periodontium and the pulp. In such cases, bacterial colonization of the groove will cause periodontal inflammation and subsequent tissue breakdown. Pulp involvement may result as a result of introduction of bacterial toxins via channels that exist between the root canal system and the groove (4). Once the pulp becomes necrotic, endodontic therapy is indicated. However, conventional endodontic treatment alone will not be effective because the bacterial etiology is residing extraradicularly as a self-sustaining lesion (4).

The reported long-term prognosis of therapy appears to be mostly related to the apical extension of the groove (3–6). Shallow grooves may often be treated successfully (5, 6), while deep grooves

Fig. 3. One-year follow-up radiograph showing substantial decrease in size of the periradicular radiolucency. The tooth is asymptomatic, and the patient is comfortable.

present complex endodontic-periodontal problems with a poor prognosis (3, 4). In the case presented here, the radicular groove was deep and extended to the apical third of the root. Nevertheless, a combined treatment modality involving endodontic therapy, intentional replantation, elimination of the groove, and Emdogain® therapy proved to be successful at 1-year follow-up.

The rational for using Emdogain® in this case is based on its ability to promote periodontal tissue regeneration and to prevent root resorption and/or ankylosis (10–13).

It was reported that Emdogain® may induce and promote apposition of acellular cementum, which plays an important role in the formation and repair mechanisms of the periodontal ligament and alveolar bone (14). Application of Emdogain® to experimental buccal dehiscences in monkeys induced almost complete regeneration of acellular cementum (14). Furthermore, this cementum was firmly attached to the dentin exhibiting collagenous fibers extending into the newly formed alveolar bone.

The exact mechanism of periodontal repair following Emdogain® therapy has not yet been fully elucidated. Its mode of action may be explained by the regulatory effects of enamel-related proteins during initiation, propagation, termination, and maturation phases of the enamel hydroxyapetite crystallites and by the sequence of events occurring during root development (14–17). There is increasing evidence that the Hertwig's epithelial root sheath cells secrete enamel matrix proteins during root formation and that these proteins are involved in the formation of acellular cementum during nascent tooth development. The acellular cementum is critical for the attachment of ligament fiber bundles to the root surface, thus allowing regeneration of the periodontal ligament and alveolar bone to occur (10). In the case presented here, evidence of periodontal ligament attachment and alveolar bone active healing was evident during 1 year following treatment.

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