Combined Endodontic Therapy and Intentional Replantation for the Treatment of Palatogingival Groove

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Abstract

A palatogingival groove is an anatomic malformation that predisposes the involved tooth to a severe periodontal defect. When the condition is complicated by pulpal necrosis, affected teeth often present a dilemma in terms of diagnosis and treatment planning. In this report, we describe the case of a patient with a maxillary lateral incisor with a deep palatogingival groove extending to the root apex and severe periodontal destruction (local pocketing). Suggested treatment modalities included curettage of the affected tissues, elimination of the groove by grinding and/or sealing with a variety of filling materials, and surgical procedures. In this case, a combined treatment approach, involving both endodontic therapy and intentional replantation after restoration with a self-etching flowable composite, resulted in almost complete periodontal healing and significant healing of the root canal periodontal defect. When the condition is complicated by pulpal necrosis, affected teeth often present a dilemma in terms of diagnosis and treatment planning. In this report, we describe the case of a patient with a maxillary lateral incisor with a deep palatogingival groove extending to the root apex and severe periodontal destruction (local pocketing). Suggested treatment modalities included curettage of the affected tissues, elimination of the groove by grinding and/or sealing with a variety of filling materials, and surgical procedures. In this case, a combined treatment approach, involving both endodontic therapy and intentional replantation after restoration with a self-etching flowable composite, resulted in almost complete periodontal healing and significant healing of the root canal periodontal defect.

Key Words
Developmental anomalies, intentional replantation, maxillary lateral incisor, palatogingival groove

Palatogingival or palatal groove is defined as an anatomic malformation of developmental origin usually found on the lingual aspect of the roots of maxillary incisor teeth (1). Such grooves usually start near the cingulum of the incisor and run apically down the cementoenamel junction, terminating at various depths along the root (2). Many other terms have been used to describe this anomaly, including palatal groove (3, 4), developmental radicular anomaly (5), distolinguinal groove (6), radicular lingual groove (7, 8), palatogingival groove (9, 10), radicular groove (11), and cinguloradicular groove (12).

The etiology of the palatogingival groove remains unclear. Some authors have proposed that the defect is a mild form of dens invaginatus and results from infolding of the enamel organ and Hertwig epithelial root sheath before the calcification phase (2, 6), whereas others have postulated that it is the result of a failed attempt by a tooth to form an additional root (5, 13). However, Ennes and Lara (14) suggested that an alteration of genetic mechanisms may be responsible for the occurrence of the groove. The incidence of a palatogingival groove is reportedly between 2.8% and 18% (6, 9, 10, 15). The broad range of percentages reported may be caused by variations in study design, the ethnicity of participants, region, sample size, and/or diagnostic criteria.

Given the cervical location of this anomaly, a palatogingival groove may provide a pathway by which bacteria can penetrate the periodontal ligament (PDL) area, leading to the accumulation of bacterial plaque and contributing to localized periodontitis (2). Once a breach in the periodontal attachment involving the groove occurs, a self-sustaining localized periodontal pocket can develop along the length of the groove (5). Furthermore, there may be communication between the pulp canal system and the periodontium through the pulp cavity and/or accessory canals; thus, these grooves may also lead to combined endodontic-periodontal lesions (16, 17).

Palatogingival grooves on maxillary incisors often present a dilemma in terms of diagnosis and treatment planning. Multiple case reports have described treatment modalities ranging from the resection of an accessory root to periodontal regeneration with various materials depending on the extent of the osseous defect (16–23). In this case report, we present the case of a patient with an anatomically complicated lateral incisor with, according to Gu’s classification (24), a type II palatogingival groove. A combined treatment approach, involving both endodontic therapy and intentional replantation after restoration with a self-etching flowable composite, resulted in almost complete healing of the periapical radiolucency at 12 months.

Case Report

A 50-year-old woman was referred for root canal treatment of the maxillary right lateral incisor (tooth #7) (Fig. 1A). The patient’s chief complaint was of a purulent discharge from tooth #7 over the preceding 4 months. A clinical examination revealed that tooth #7 had resin composite in the access opening without caries or fracture. As expected, vitality testing (electric and thermal) yielded negative results, whereas percussion testing yielded positive results. Testing of the adjacent and contralateral teeth elicited normal responses. A draining sinus tract was evident on the adjacent labial alveolar mucosa. The patient was unaware of any previous trauma to the maxillary anterior region. Investigation of the patient’s medical history failed to identify any relevant conditions. Tooth mobility was within physiologic limits. A more detailed clinical examination revealed a groove emerging from the cingulum that continued distoapically.

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down the palatal aspect of the root. Periodontal probing around the maxillary incisors revealed local pocketing almost to the apex on the distopalatal region of tooth #7. Facially, the gingival sulcus had a normal probing depth. Oral hygiene was poor, and calculus surrounded the tooth.

Radiographic examination revealed an extensive periradicular radiolucency involving the apical two thirds of the root of tooth #7. The sinus tract was traceable, with a gutta-percha cone to the distal area (Fig. 1B). In addition, 2 narrow, vertically oriented radiolucent lines were evident on the radiographs. We diagnosed a combined endodontic-periodontal lesion with periodontal breakdown associated with a palatogingival groove and concomitant pulpal necrosis. During this appointment, an interdisciplinary treatment plan was formulated; the patient was informed that tooth #7 had a questionable long-term prognosis because of the length of the radicular groove and the ability to treat the defect periodontally.

Three weeks later, after prophylaxis and removal of the localized calculus, the resin composite in the access opening was removed under rubber dam isolation (Hygenic Dental Dam; Coltene Whaledent, Langenau, Germany). When the pulp chamber was reached, the root canal orifice and palatogingival groove were visible. Figure 1C shows the communication between the radicular groove and the pulp chamber. The root canal was shaped using a size 10 and 15 K-files (Dentsply Maillefer, Ballaigues, Switzerland) to obtain a manual glide path. Instrumentation was completed using Miwo nickel-titanium rotary instruments (VDW GmbH, Munich, Germany) with an X-Smart endodontic motor (Dentsply Maillefer). The instrumentation sequence was size 10, 0.04; 15, 0.05; 20, 0.06; 25, 0.06; 30, 0.05; and 35, 0.04. Copious irrigation with 4.2% sodium hypochlorite (NaOCl) in a plastic syringe with a closed-end needle (Hawe Max-i-Probe; Kerr-Hawe, Bioggio, Switzerland) was performed at each step of instrumentation. After root canal preparation, a final irrigation was performed, which alternated between 17% EDTA and 4.2% NaOCl solution. The last NaOCl irrigation was activated with a size 20 K-file (Satelec Acteon Group, Merignac Cedex, France) for backfilling (Fig. 1D and E). The access cavity was etched, primed, and filled with light-cured resin composite (Filtek Supreme XTE; 3M ESPE, Seefeld, Germany).

At an evaluation appointment 2 months later, the pocket depth associated with the palatogingival groove had not decreased, and it bled on probing as expected. The patient was asymptomatic but, because the facial sinus tract persisted, she was scheduled for an intentional replantation. The patient was prescribed antibiotics (amoxicillin plus clavulanic acid 1 g daily) starting the day before surgery and continuing for another 6 days (25) and was instructed to rinse her mouth with a 0.12% solution of chlorhexidine twice daily for 1 week. To avoid tooth fracture and minimize mechanical damage to the PDL, elevators were not used to luxate the tooth before extraction (Fig. 24). A rubber dam was placed around the handle of the forceps to maintain constant pressure on the crown. The tooth was extracted gently with no intraoperative complications; subsequently, the patient was instructed to bite on moist gauze during the extrarotal procedures.

The extracted tooth was gently rinsed with physiologic saline. Under a dental microscope (DF Vasconcellos, São Paulo, SP, Brazil), the
palatogingival groove extending to the root apex was clearly visible. No abnormalities, such as fractures, cracks, or accessory canals, were detected. The tooth was held gently by the crown and root with physiologic saline-soaked gauze during the extraoral procedure. The root end was resected with a high-speed turbine using copious water. Subsequently, the radicular groove was removed with a small diamond bur, the root apex was flattened, and a class I cavity was prepared (Fig. 2B). Both the palatogingival groove and the root apex were filled with a self-adhesive dental composite (Vertise Flow; Kerr Corp, Orange, CA) (Fig. 2C). Using a surgical curette, periapical granulation tissue was removed from the periapical region without damaging the socket wall. The complete extraoral procedure lasted 4 minutes. The tooth was then replanted into its alveolar bone (Fig. 2D) and splinted with a semirigid splint for 7 days.

At a 3-month recall, the sinus tract had closed, and the patient was asymptomatic (Fig. 2E). Probing revealed no pockets extending beyond 3 mm (Fig. 2F). At a 1-year recall, the tooth showed almost complete periapical healing (Fig. 3A). The tooth remains asymptomatic, and the patient is comfortable (Fig. 3B).

**Discussion**

A palatogingival groove is a developmental anomaly of the maxillary central and lateral incisors. It usually begins in the central fossa, crosses the cingulum, and extends apically although the distance and direction of this extension vary (2, 5, 9). Gu’s findings (24) confirmed that these radicular grooves exhibit a broad spectrum of morphologic variations; the grooves are markedly variable in depth, length, location, and complexity. Kogon (9) investigated 3168 extracted maxillary lateral and central incisors; 4.6% possessed a palatogingival groove. Approximately half of all grooves terminated at the root, and 58% extended more than 5 mm from the cementoenamel junction. Fifty-four percent of the palatogingival grooves in Kogon’s study were described as shallow depressions, 42% as deep depressions, and 4% as closed tubes.

Palatogingival grooves act as a nidus for plaque formation, often promoting the development of a combined endodontic-periodontal lesion via communication between the pulp canal system and the periodontium through accessory canals. These circumstances can lead to misdiagnosis of the groove as a primary endodontic lesion.

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**Figure 2.** (A) Elevators were not used to luxate the tooth before extraction. (B) The palatogingival groove and the root apex (1 mm) were removed with a small diamond bur. (C) Sealing of both the palatogingival groove and the root apex using a self-adhesive dental composite (Vertise Flow). (D) A postoperative radiograph taken immediately after tooth replantation. (E) A postoperative radiograph at a 3-month recall. (F) Probing revealed no pockets extending beyond 3 mm.
Misdiagnosis may also occur because the clinical picture is suggestive of a periodontal abscess, whereas radiographically a palatogingival groove can resemble a vertical root fracture or an extra root canal (24, 26).

The successful management of a tooth with a palatogingival groove is dependent on both effective periodontal treatment and resolution of the associated localized periodontal defect (19). Endodontic therapy is indicated once the pulp has become necrotic. However, conventional endodontic treatment alone is insufficient because the bacteria live outside the root, yielding a self-sustaining lesion (27). Ultimately, the outcome of treatment for periodontal defects determines the prognosis of these teeth. Shallow grooves can often be treated successfully (12), whereas deep grooves present complex endodontic-periodontal problems with a poor prognosis (5, 27). Fortunately, new treatment options are available with better potential to save such teeth. Although the treatment of palatogingival grooves has not been evaluated in a controlled investigation, multiple case reports describe different treatment modalities (5, 26, 27). Suggested treatment approaches include curettage of the affected tissues, elimination of the groove by grinding and/or sealing with a variety of filling materials, and surgical procedures (18–23).

In this case, intentional replantation was the chosen treatment modality. Intentional replantation is not a new procedure. According to Dryden and Arens (28), Pierre Fauchard first described its use in the 18th century. Over time, the indications for intentional replantation have evolved. Peer (29) listed a wide range of indications, including failure of root canal treatment, anatomic limitations, problems with accessibility, persistent chronic pain, accidental exarticulation, involuntary rapid orthodontic extrusion, and patients with objections to periradicular surgery and trismus. Intentional replantation is an accepted endodontic-periodontal treatment procedure in which a tooth is extracted and treated outside the oral cavity and then reinserted into its socket to correct the defect (4, 26). However, the palatal surgical approach is difficult, especially for a type II palatogingival groove such as this (27, 37). Aware of the prognosis associated with intentional tooth replantation, we decided that this was the treatment of choice.

In this report, we described the successful management of a combined endodontic-periodontal lesion precipitated by a type II palatogingival groove (24), the prognosis of which was considered poor. The treatment outcomes achieved in this case were no pockets extending beyond 3 mm, no gingival recession, and significant resolution of the radiographic radiolucency at a 12-month follow-up. There is no reason to believe continued healing will not occur. Therefore, this case shows the importance of preserving the PDL and limiting the extraoral time to 30 minutes (33, 34). An extraoral time greater than 30 minutes increases the possibility of replacement resorption (35). In this case, the tooth was held gently at both the crown and root with gauze soaked in physiologic saline. The total extraoral time was only 4 minutes, allowing us to avoid the application of any solution, such as tetracycline, citric acid, EDTA, or enamel matrix derivative, to the root surface to enhance PDL fiber attachment or prevent ankylosis (25, 36).

Several materials have been used to fill palatogingival grooves (37, 38). Although mineral trioxide aggregate sets in the presence of moisture, it can get washed off transgingival defects (26). Glass ionomer cement is suitable because it does not have this drawback (39, 40). Recently, an innovative, resin-based material that combines self-adhesion and flowability was developed (Vertise Flow), introducing a new category of restorative materials termed self-adherent composite resins. The exclusion of rinsing and drying steps in their application is an attractive clinical advantage because the risk of contamination is reduced, and the bonding procedure is less sensitive to potential over-drying or overwetting (41, 42). Despite the appeal of the simplified handling of single-step adhesives, some aspects of their bonding mechanism, such as the etching potential in various clinical situations and bond durability, are still being studied.

In this case, periodontal surgery, involving elimination of the palatogingival groove and sealing with a choice of filling materials, was an option (4, 26). The groove extended beyond the middle third of the root apex, necessitating the use of barriers and/or intraosseous grafts to correct the defect (4, 26). However, the palatal surgical approach is difficult, especially for a type II palatogingival groove such as this (27, 37). Aware of the prognosis associated with intentional tooth replantation, we decided that this was the treatment of choice.
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References
