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CASE REPORT

Management of Palatogingival Groove using the Innovative Tricalcium Silicate Material Biodentine™

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ABSTRACT

Palatogingival grooves (PGG) are developmental malformations that cause endodontic–periodontal lesions. Owing to their inconspicuous occurrence, funnel-shaped morphology, and variable extent on tooth root, they promote adherence of plaque and bacteria to levels significant for the development of pathology. Several treatment approaches have been recognized in the literature for the management of this anomaly. Here, in this report, a 32-year-old female patient reported with the complaint of pain and swelling in maxillary left lateral incisor. Clinical examination confirmed an endodontic–periodontal lesion in relation to PGG. Endodontic treatment was instituted followed by odontoplasty of the groove and restoration with newer calcium silicate cement, Biodentine. Combined endodontic–periodontal approach was successful in resolving the pathology with complete healing seen both clinically and radiographically. Timely diagnosis, prevention, and management are highly recommended to prevent tooth loss due to complications arising secondary to their presence.

Keywords: Biodentine™, Developmental malformation, Maxillary lateral incisor, Palatogingival groove.

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INTRODUCTION

Maxillary lateral incisors are of embryological importance because they are frequently known to exhibit diverse morphologic and anatomic abnormalities, such as peg shape, dens invaginatus, Eagle's talon, palatogingival groove (PGG), germination, fusion, and accessory root. A PGG can be defined as "a developmental groove in a root that, when present, is usually found on the lingual aspect of maxillary incisor teeth."[1] According to Goon et al,[2] PGG can be classified as simple and complex. The simple PGG does not communicate with the pulp and represents a partial unfolding of Hertwig's epithelial root sheath, while complex PGG communicates directly with the pulp and groove that extend the length of the root. In rare cases, this groove can become minor accessory root, which may contain a root canal.

Palatogingival groove, also known as *palatoradicular groove, coronoradicular groove, distolingual groove, orradiculolingual groove*, is described as a developmental malformation that exists on the palatal aspect of the incisor teeth and runs toward the mesial, distal, or midpalatal root regions.[3,4] It has a reported incidence ranging from 2.8 to 18%.[5] The location and anatomy of these malformations are such that they promote adherence of plaque and render relatively easy involvement of the dental pulp contributing significantly toward the development of endodontic–periodontal lesions. In cases when the pulp becomes necrotic, the tooth requires endodontic treatment along with periodontal therapy. However, the prognosis of these teeth mainly depends on the ability to adequately treat the periodontal defect that in turn determines the prognosis of such teeth. Suggested treatment modalities are curettage of the affected tissues, elimination of the groove by grinding (saucerization), or by sealing with a variety of filling materials.[6]

CASE REPORT

A 32-year-old female patient reported to the dental clinic with a chief complaint of pain and swelling in maxillary left lateral incisor for the past 10 days. The patient did not give a history of previous trauma, swelling, or severe pain with respect to the concerned tooth. During clinical examination, the left maxillary lateral incisor had an intact crown without caries or fracture (Fig. 1), with negative vitality testing and a positive response to percussion. The patient's overall oral hygiene status appeared satisfactory. On periodontal probing, a 7 mm pocket could be probed on the midpalatal aspect of the root (Fig. 2), and the intraoral periapical radiograph of the tooth showed a periapical radiolucency of about 1 cm (Fig. 3).

A combined endodontic–periodontal treatment was planned for this tooth. In the first phase, an endodontic therapy was carried out. An access cavity preparation was done and working length was assessed using #15

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Fig. 1: Preoperative clinical buccal view

Fig. 2: Preoperative clinical palatal view illustrating periodontal pocket

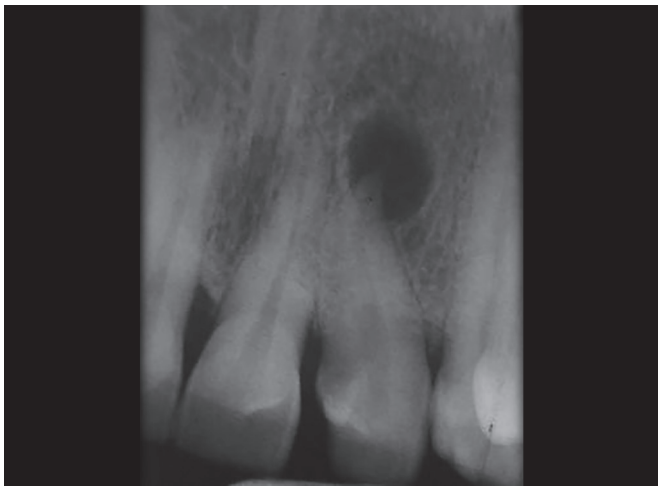

Fig. 3: Preoperative radiograph showing periapical radiolucency with 22

Fig. 4: Radiograph after obturation

K file with an intraoral periapical radiograph. The canal was cleaned and shaped with stainless steel K-files using step-back technique. The canals were irrigated with 5.25% sodium hypochlorite and normal saline throughout the procedure. Calcium hydroxide (Apexcal) was packed into the canal as an intracanal medicament and the access cavity temporarily sealed with the intermediate restorative material (IRM, Dentsply Caulk, Milford, DE). The patient reported after 1 week, and the tooth was asymptomatic. The root canal was irrigated with normal saline and dried using paper points. Before obturation, master cones were selected to check the fit within the canal and radiograph was taken. The canal was obturated by lateral condensation technique using AH-Plus sealer (Dentsply Maillefer, USA). The coronal gutta-percha cones were sheared off using heated instrument, and vertical compaction was done using the heated hand pluggers (Fig. 4). Access cavity and the coronal accessible portion of the groove were restored with glass ionomer cement (Ketac Molar, 3M ESPE AG, Germany). On recall visit after 1 week, pocket depth had reduced to 5 mm, but did exist.

During the periodontal phase of the therapy, complete extraoral and intraoral mouth disinfection done with betadine and local anesthesia was achieved after administering 2% lignocaine with 1:100,000 adrenaline following which a full-thickness periosteal flap was raised using intrasulcular incision and vertical releasing incision. A surgical flap was raised from the labial aspect and palatal aspect, and the PGG was isolated to its most apical extent (Figs 5 and 6).

Thorough scaling and root planing were performed over the groove to remove the bacteria that might have colonized there. The diseased granulation tissue was curetted out with Gracey curette number 1/2 and 5/6 (Hu-Friedy Manufacturing., Chicago, IL, USA) to leave the soft tissue more conducive to regeneration from the bony defect. Then, the groove was shaped with

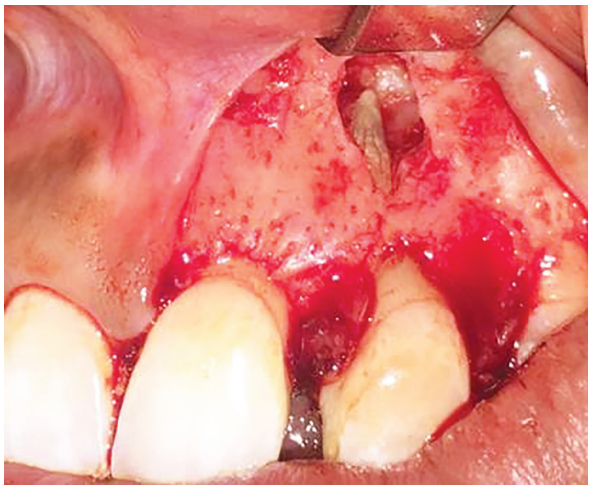

Fig. 5: Labial flap elevation showing bony defect

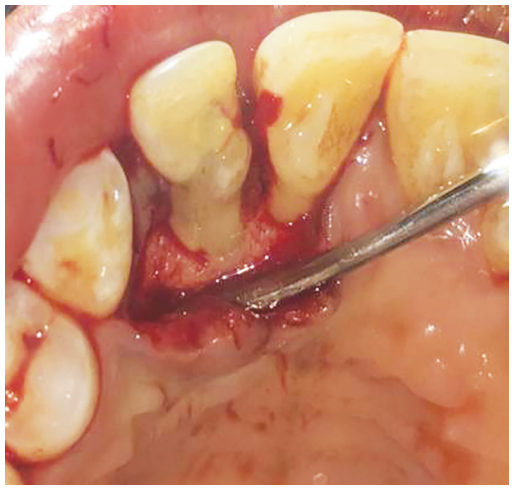

Fig. 6: Palatal flap elevation showing PGG

Fig. 7: Sealing of PGG with biodentin

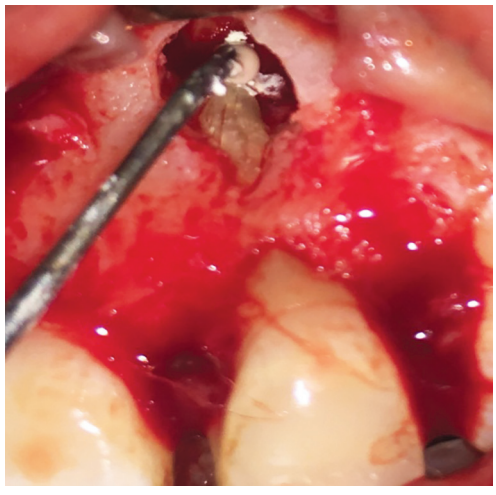

Fig. 8: Sealing of the apex with biodentin

the high-speed round diamond point under the air–water spray and blended smoothly with the adjoining surface to receive the restorative material. Chemical conditioning of the groove was done and Biodentine™ (Septodont, St. Maur-des-Fosses, France) was applied into the defect (Fig. 7) after proper control of the bleeding. Then the material was allowed for an initial set of about 9 minutes and the tissues were kept hydrated using moist gauze piece.

With the help of a micromotor handpiece with surgical length bur, the apical root end was resected and sealed with Biodentine™ (Septodont, St. Maur-des-Fosses, France) (Fig. 8). The bony defect that was created after curettage of periapical tissues was filled with freeze-dried bone allograft (LifeNet, Virginia Beach, VA) (Figs 9 and 10), and an absorbable gelatin sponge Abgel was placed (Fig. 11). The flaps were secured with nonresorbable 3-0 silk sutures. Antibiotics and analgesics were prescribed for 5 days, and regular oral hygiene instructions were given to the patient including chlorhexidine (0.12%) mouth rinse for 2 weeks.

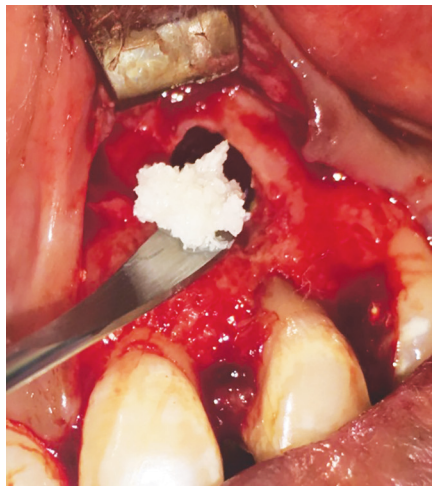

Fig. 9: Osseous graft placement

The patient was asymptomatic postoperatively, and the suture removal was done after 7 days. The patient was recalled for a check-up at 1, 3, and 6 months. At 6 months follow-up, gingiva appeared healthy, and probing depth further reduced to 3 mm. Clinically, there was a reduction

Fig. 10: Site after graft placement

Fig. 11: Absorbable gelatin – Abgel placement

Fig. 12: Follow-up radiograph after 6 months showing reduction in periapical radiolucency

in the pocket depth of 4 mm in 3 months and patient is asymptomatic with nonbleeding sulcus and there was a significant reduction in radiolucency radiographically (Fig. 12). Further follow-ups have to be done 12 and 24 month intervals.

DISCUSSION

The PGG is clinically significant because it serves as an ideal harbor for plaque and microorganisms from where focal periodontitis can initiate. These PGGs are seen to extend beyond the cementoenamel junction onto the root surface in more than 50% of the cases. Among these grooves traversing the root, 43% have shown to extend apically <5 mm in distance, 47% between 6 and 10 mm, and 10% beyond 10 mm.[3] Depending on the invagination of the groove toward the pulp cavity, these grooves can be termed as shallow/flat (<1 mm), deep (>1 mm), and a closed tube.

In our case, PGG existing on the left lateral incisor can be classed as complicated/type III since it was extending more than two-thirds of the root length. This was less apparent on radiographic examination, but was appreciated during clinical probing and confirmed later on reflection of the flap. Periodontal attachment loss associated with these grooves and the grooves which are extending to the apical third of the root could result in a hopeless prognosis for tooth survival. Moreover, in cases where the pulp has also become necrotic, the tooth requires endodontic treatment in addition to periodontal therapy. So the aim of our treatment was to eliminate the groove by using an innovative restorative material and to regenerate the attachment apparatus.

In our case, the pulp in the affected lateral incisor was necrotic; hence, there was a need for endodontic treatment in addition to periodontal therapy. Also, the groove was deep; hence the internal canal system of the tooth was also presumed to be complex. Many restorative materials have been used for eliminating the groove, like composites, mineral trioxide aggregate (MTA), and glass ionomer cement. Tricalcium-based cement called Biodentine™ was used in the present case. Biodentine™ is recommended for use as both an endodontic repair material and a dentin substitute under resin composite restorations. The powder of biodentine contains tricalcium silicate, dicalcium silicate, calcium carbonate and oxide, iron oxide, and zirconium oxide; and the liquid component includes calcium chloride and a water-soluble polymer. The advantages of Biodentine™ over the other products are the reduced setting time (a few minutes compared with several hours for MTA) and improved mechanical properties. Moreover, its sealing ability, when in contact with dentin, is also proven. The improved sealing ability is because of the formation of hydroxyapatite crystals at the surface, especially at the dentin material interface. The higher push-out bond strength unaffected by blood contamination and improved physical and mechanical properties in comparison to MTA further makes Biodentine a superior repair

material. In our case also, the application of Biodentine in the management of complicated PGG gave successful treatment outcome similar to reported cases by Johns et al[7] and Liji and Rameshkumar.[8]

Several materials were utilized to optimize regeneration of the lost periodontal and osseous structures. The freeze-dried bone allograft was chosen to fill the osseous defect because of its osteoconductive nature, and its ability to be converted into bone more rapidly than demineralized freeze-dried bone allograft.

An interdisciplinary approach combining endodontic treatment and periodontal therapy most often needs to be instituted when managing this type of complex cases. Endodontic treatment with open flap debridement and simple closure of the coronoradicular groove with Biodentine proved successful in preventing apical ingress of microorganisms and in promoting excellent healing both clinically and radiographically. Biodentine, because of its easier handling characteristics, shorter setting time, improved mechanical properties, good biocompatibility, and regenerative potential, appears as a promising alternative to routinely used reparative materials for treatment of anatomic defects.

CONCLUSION

The presence of a PGG will develop as pathology whenever there is a breach in the epithelial attachment subsequent to postplaque retention resulting in progressively advancing inflammation. However, when a palatal groove does occur and a timely diagnosis is made, there are recognized ways to manage the situation, and in many cases, the involved tooth can be saved.

CLINICAL SIGNIFICANCE

Thorough clinical examination of the lingual surface of incisors should be encouraged as a part of the routine protocol. If their presence is suspected, they should be restored either preventively to restrain subsequent complications or subjected to regular prophylaxis and the concerned tooth kept under constant reevaluation.

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