The Complex Radicular Groove: Interdisciplinary Management with Mineral Trioxide Aggregate and Bone Substitute

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ABSTRACT
This article is a case report of the successful interdisciplinary management of a maxillary lateral incisor with a deep palatogingival groove. The tooth presented with severe periodontal destruction owing to the deep extension of the groove up to the root apex. The groove was meticulously diagnosed and treated by endodontic and subsequent periodontal surgery leading to complete resolution of the pathological process.

Keywords: Interdisciplinary management, Maxillary lateral incisor, Palatogingival groove, Mineral trioxide aggregate, Radicular groove.


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INTRODUCTION
Morphological defects in dental structure like, e.g. dens invaginatus, talon cusp, and the palatogingival groove remain an enigma to the endodontists worldwide. To combat these developmental anomalies all we need is right diagnosis, right treatment plan and the right management.

Palatogingival groove is a developmental anomaly that starts near the cingulum of the tooth and runs down the cementoenamel junction in apical direction, terminating at various depths along the root. This anomaly predominantly is encountered in maxillary lateral incisors along the palatal surface with a prevalence rate of 2.8 to 8.5%.2,3

The significance of this funnel-shaped defect lies in the fact that it makes the tooth a susceptible niche for bacterial plaque accumulation and subsequent inflammation. Complicated by the palatal occurrence and patient's inability to keep the area clean, periodontal breakdown is inevitable.4

Lee et al5 reported an association between palatogingival groove and apical periodontitis.

The prognosis of teeth with palatogingival groove is compromised when there is severe periodontal destruction as well as a periapical inflammatory lesion. The success of any treatment modality in such cases depend on the depth of the groove, the groove's extension, and the relation of the groove to the root canal.1,3,6

The anatomical complexity of the radicular groove demands a keen and insightful method of diagnosis and a multifaceted treatment approach by the clinician. Given the great clinical importance of the palatogingival groove and its sporadic occurrence, the objective of this paper is to present a report of a case of palatogingival groove and the interdisciplinary management of the same using contemporary techniques.

CASE REPORT
A 27-year-old patient reported to the Outpatient Department of Conservative Dentistry and Endodontics, Bapuji Dental College and Hospital. On clinical examination, the left maxillary lateral incisor (#22) had a discolored intact crown without caries or fracture. The tooth was tender on percussion and pulp sensibility tests showed a negative response on comparison to the adjacent teeth. The mobility of the tooth was within physiological limits. On periodontal examination, there was a 9 mm pocket depth and purulent exudate associated with a palatogingival groove on the palatal aspect of the tooth (Fig. 1).

Intraoral periapical radiograph revealed the presence of a well circumscribed periapical radiolucency indicating...
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chronic apical periodontitis. A patent root canal was seen with another parapulpal radioluent line (Fig. 2), which is a typical radiographic representation of the palatogingival groove.

Hence a diagnosis of endodontic periodontal lesion with palatogingival groove presenting with pulpal necrosis and chronic apical periodontitis was inferred. Following this, an interdisciplinary treatment plan was devised for the patient.

**TREATMENT PROTOCOL**

**Endodontic Phase**

The tooth was isolated with rubber dam. Access cavity preparation was done followed by working length determination which was confirmed with a radiograph. Subsequently, the cleaning and shaping procedures were undertaken using the conventional step back technique with an apical preparation up to size 60 K. (Mani Inc, Ulsunomiya, Japan). Copious irrigation between instrumentation was done using 1% sodium hypochlorite with alternate irrigation with 17% ethylenediamine tetraacetic acid. Calcium hydroxide intracanal medicament was placed in the interappointment period. The tooth was obturated with gutta-percha and zinc oxide eugenol based sealer using lateral condensation technique (Fig. 3).

Radiographic assessment after obturation showed a thin radiopaque line extending from the midroot level to the apical third indicating an obturated lateral canal (Fig. 3).

**Periodontal Phase**

During the periodontal phase of the therapy, a full thickness mucoperiosteal flap was raised from the palatal aspect, and the palatogingival groove was identified to its complete apical extent. Thorough scaling and root planing were performed to eliminate the calculus and microorganisms. Curettage of the granulation tissue was done (with Gracey curette number 1, 2 and 5, 6; (Hu-Friedy Manufacturing Co, Chicago, IL) to make the periodontium more conducive to regeneration. Preparation of the groove was done to receive the sealing material, mineral trioxide aggregate (ProRoot MTA, Dentsply, Tulsa Dental) (Fig. 4). The cement was mixed with saline to obtain a packable consistency. This mix was applied into the radicular part of the defect. A chemical conditioning of the coronal part of the groove was done using 10% polyacrylic acid, and glass ionomer cement type II (Fuji II, GC Corporation, Tokyo, Japan) was applied into the defect. After both the cements had hardened, the localized bony cavity was filled with bone graft (Spongious bone substitute; Geistlich Pharma AG, Wolhusen, Switzerland) (Fig. 5). The flap was approximated and supported with single interrupted sutures. The postoperative radiograph showed a radiopaque line adjacent to the radiopacity of the gutta-percha indicating a satisfactory seal with ProRoot MTA. Patient was instructed on postsurgical precautions and maintenance therapy, which included chlorhexidine rinse (0.12% solution) twice a day for 5 weeks. During this period he was recalled once a week for professional tooth cleaning.

**Fig. 1:** Discolored maxillary left lateral incisor with 9 mm Pocket depth on periodontal examination

**Fig. 2:** Preoperative intraoral periapical radiograph of maxillary left lateral incisor showing typical parapulpal radiolucent line

**Fig. 3:** Completion of root canal therapy of maxillary left lateral incisor
Follow-up

Follow-up was done for period of 1 year during which there was a significant clinical attachment gain of 6 mm and disappearance of the periapical radiolucency in the intraoral periapical radiograph (Fig. 6).

DISCUSSION

Various authors have proposed different opinions regarding the formation of the palatogingival groove. Some authors proposed that this anatomical anomaly is a mild form of dens invaginatus, whereas others consider that...
it is the incomplete attempt of a tooth to form another root. Ennes and Lara et al suggested that an alteration of genetic mechanisms could be responsible for the groove occurrence.\(^8\)

The funnel-like shape of the palatogingival groove promotes the accumulation of plaque and calculus, making thorough cleaning by the patient, or even by the dentist, nearly impossible.\(^9\)\(^-\)\(^\text{11}\) Periodontal disease may hence ensue jeopardizing the pulpal health depending on the grooves depth and communication through apical foramen, accessory and lateral canals.\(^12\)

The rationale behind the chosen treatment modality was the following: (1) complete elimination or partial saucерization of the radicular portion of the groove to remove bacterial plaque and calculus and to avert recolonization of microorganisms; (2) cleaning and appropriate sealing of the coronal and radicular portion of the groove with glass ionomer cement and mineral trioxide aggregate respectively (3) regeneration of periodontal attachment and bone and consequently improvement of the clinical conditions (reduction in pocket depth).

The prognosis of teeth affected by this anomaly depends on the location, depth, and extension of the groove and the extent of periodontal destruction.\(^13\)\(^\text{14}\) Successful treatment of this particular type of palatogingival groove depends on the ability to eradicate inflammatory irritants by eliminating the groove and encouraging the patient to keep good hygiene.

Materials, such as composite, amalgam and glass ionomer cement, have been used to fill the palatogingival groove.\(^15\)\(^\text{16}\) In the present case, mineral trioxide aggregate was chosen to seal the radicular portion of the groove, because of its proven biocompatibility, excellent sealing ability, hard tissue inductive and conductive properties.\(^17\)\(^\text{18}\) Glass ionomer cement was used to seal the coronal part of the groove due to its advantages of having chemical adhesion to the tooth structure, antibacterial property, adequate seal ability and promoting epithelial and connective tissue attachment.\(^19\)\(^\text{20}\)\(^\text{21}\)

Bone fill is a desirable result of periodontal regeneration procedures. Several reports indicate that bone fill is enhanced by the addition of a graft material.\(^22\)\(^\text{23}\) Hence, in the present case a bone substitute was used to fill the defect and enhance healing of lesion.

**CONCLUSION**

The following conclusions can be drawn:

- Effective diagnosis of the palatogingival groove is critical.
- Complex interdisciplinary approach can have hope for teeth with extremely poor prognosis.
- Mineral trioxide aggregate can be a beneficial and effective restorative option for teeth with palatogingival grooves.

**REFERENCES**


