Palatoradicular Groove: A Local Factor for Local Pathology

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ABSTRACT
Palatoradicular groove (PRG) is a developmental morphological defect which usually affects the maxillary incisors. These anomalies often act as funnel traps aiding plaque accumulation leading to severe localized periodontitis with or without pulpal necrosis. A thorough clinical examination with emphasis on the periodontal examination along with appropriate diagnostic aids can lead to early diagnosis and management of the tooth/teeth involved leading to longevity of the tooth/teeth concerned in the oral cavity. This review highlights about the clinical relevance and the different treatment modalities available to treat this anatomical anomaly.

Keywords: Funnel traps, Localized periodontitis, Maxillary incisors, Palatogingival groove, Palatoradicular groove.

INTRODUCTION
Periodontitis is a multifactorial disease with microbial dental plaque as the initiator of periodontal disease and is one of the two major dental diseases that affect human populations worldwide at high prevalence rates. Dental plaque or microbial biofilms are matrix enclosed bacterial population adherent to each other and/or to surfaces or interfaces. However, the manifestations and progression of periodontitis is influenced by a wide variety of determinants and factors, including subject characteristics, social and behavioral factors, systemic factors, genetic factors, microbial composition of dental plaque, tooth level factors.

Local factors can be defined as anything that influences the periodontal health status at a particular site or sites with no systemic effects. These local factors can be any irregularities in root anatomy, subgingival restorations margins, overhanging restorations and these factors can enhance bacterial adhesion to tooth/root surfaces and allow the growth of subgingival plaque which can alter changes in the local environment upsetting the balance between health and disease resulting in periodontal destruction. Though periodontitis can be prevented by proper hygiene measures and professional care, but it is also important to control important risk factors for the disease. This forms the basis of the new approach proposed by the World Health Organization (WHO) for management of non-communicable chronic diseases. So the new paradigm for managing periodontal diseases is therefore in modifying the risk factors. These local factors are modifiable.

One of the local factor which is often been related to localized destruction of periodontal tissue and endodontic complications is palatoradicular groove (PRG). Palatoradicular groove is a morphological defect associated with maxillary central incisors and/or lateral incisors. These defects usually occur on the lingual surfaces of the midpalatal, mesial or distal region of the tooth, but can also be seen on the buccal aspect of maxillary incisors.

History and Etiopathogenesis
Palatoradicular groove was first described as a malformation which occurred during embryo formation, later this anomaly was described as a groove which was located on the palatal surfaces of the maxillary incisors. The exact etiology of this defect is still debatable. It is believed that the radicular groove represents the mildest form of dens evaginatus and there is minimal infolding of the enamel organ and epithelial root sheath of Hertwig during odontogenesis. Many other believe that this anomaly may result when there is an attempt of the body to form another root on the affected tooth. Palatoradicular groove can also occur due to the late onset of mineralization of the crown of the maxillary lateral incisor making the tooth bud more susceptible to the infolding.

This malformation is also described in dental literature as a palatal gingival groove, radicular developmental anomaly, distolingual groove, radicular lingual groove, and syndesmo-corono radicular tooth. The palatal groove usually begins in the central fossa, cross the cingulum and extends to varying distances...
and directions down the root. The distance traversed by the groove also vary in distance the mild ones usually terminate on the crown or at the cementoenamel junction (CEJ), as when compared to the moderate grooves which continue apically along the root surface.11

Prevalence/Incidence

A prevalence of 12 to 21% in both lateral and central maxillary incisor in collections of teeth dating back to prehistoric to medieval eras.21 In a study of 500 teeth, 3% of incisors presented with palatal groove.20 In a sample of 633 maxillary lateral incisors, it was reported palatal grooves extended up to the apex in 0.47% of the upper lateral incisors and the same 0.47% of incisors the groove did not extend up to the apex.15 Palatoradicular grooves were present in 8.5% of the teeth in 531 subjects studied, but the prevalence of incisors with a palatal groove extending to the apex was only 2.3%.22 In a large sample of 3,021 teeth, the groove was detected in 4.6% of cases 10. An incidence of 2 and 2.6% was found in 500 central and 421 lateral incisors respectively.23 A high of 18% incidence of palatoradicular grooves was reported in a Chinese population.24

Clinical Relevance

Diagnosis of the (PRGs) sometimes presents a challenge to the clinicians, when a patient presents with myriad signs and symptoms relating to a true localized periodontitis or a true endodontic problem or a combination of the both.25 Clinically, the region adjacent to the groove will reveal inflamed, edematous or cyanotic gingiva, with abundant plaque and calculus deposits (Figs 1 and 2). These grooves act as funnels leading to entrapment of plaque and thus initiating a localized inflammatory process around the groove. The lesion is limited to the gingiva as long as there is no breach in the epithelial attachment. Once the attachment is breached a periodontal pocket occurs which further adds to the difficulty in plaque removal by the patients leading to a more deeper pocket sometimes extending up to the apex with subsequent pulpal involvement either through the apex or via the accessory canals leading to localized periodontitis and pulpal necrosis (Fig. 3). This may present a challenging situation in terms of diagnosing and management of these conditions. Emphasis should be made for a need of thorough clinical and periodontal examination of the tooth, which can lead to an early diagnosis of PRG, so that a proper treatment of the tooth can be carried out early thereby improving the prognosis of the involved tooth.26 Radiographically the groove may present as a parapulpal lines on the radiographs.23

Classification of Palatoradicular Groove27

Palatoradicular grooves are classified into simple PRG and complex PRG simple PRGs do not communicate with the pulp and represents a partial infolding of Hertwig’s epithelial root sheath (HERS), while the complex PRGs communicate directly with the pulp and the groove extends the length of the root.

MANAGEMENT

The prognosis and management of these PRGs depends on the apical extension of the groove, the extent to which the periodontal involvement is involved and the condition of the pulp, as well as the chronicity and adequacy to plaque control measures.

Various authors have suggested different methodologies of treatment. Most of the cases when there is only periodontal involvement without endodontic complications as in mild forms, conservative treatment like scaling and root planing, along with flap curettage is often advised,25,28 the groove is often sealed with glass ionomer cement,25 composite material or amalgam29 and calcium sulfate.19,30 In moderate form of periodontal involvement with endodontic complications, the line of treatment usually endodontic treatment followed by a
flap curettage along with saucerization or grinding of the groove.\textsuperscript{15,19,31} When there is significant extension of the groove along the root surface up to middle third, then surgical procedures with placement of osseous grafts, barrier membranes and enamel matrix derivatives are often indicated.\textsuperscript{32} A combination of endodontic, intentional replantation, without/with regenerative therapy has also been shown to be effective in managing these defects.\textsuperscript{19,32} Autologous blood products like platelet rich plasma can also be used as a mode of regeneration of the lost attachment apparatus.\textsuperscript{33}

Prognosis is deemed to be poor when there is extension of the groove till the root apex, severe bone loss and/or both. Extraction of the involved teeth is advised in these situations\textsuperscript{15,25,34} (Fig. 4).

**SUMMARY AND CONCLUSION**

Palatoradicular grooves in maxillary anteriors are often been implicated as an initiating and progressive factor in the etiology of localized periodontitis and irreversible pulpitis.

The clinicians must be very alert in diagnosing PRGs so that the patients may be educated about the possibility of future complications as well as maintenance of proper oral hygiene. Secondly with timely diagnosis proper management of the affected teeth can be instituted providing longevity of the involved tooth.

**REFERENCES**