

THE PALATO – GINGIVAL GROOVE AN ENDODONTIC – PERIODONTIC ENIGMA

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ABSTRACT

Introduction: Maxillary incisors are very susceptible to developmental anomalies that can lead to periodontal or endodontic problems. One such developmental anomaly is the palatal groove which is often associated with incorrect diagnosis and treatment failure. This report describes the identification, diagnosis, treatment plan and management of four such cases of palato-lingual grooves.

Methods: The management included a multidisciplinary approach with a combination of endodontic therapy and periodontal regenerative techniques. Root canal therapy was performed followed by flap reflection, removal of granulation tissue and odontoplasty of the groove. Bone graft was placed which helped in the improvement in clinical attachment, reduced probing depth and deposition of bone in the osseous defect. **Results:** All the four cases exhibited complete resolution of signs and symptoms of periodontal lesion with improvement of periodontal indices.

Conclusions: Flap operations with direct glass - ionomer restoration is thought to be an acceptable method which can produce favorable results in the treatment of periodontal lesions caused by palato -lingual groove on the maxillary lateral incisor.

KEY WORDS

Maxillary incisors, Palato-radicular groove, endodontic periodontal lesion, interdisciplinary approach, bone graft, Hertwig's epithelial root sheath, pulp necrosis, localized periodontitis, periodontal regeneration.

INTRODUCTION

Radicular grooves are the morphological teeth predisposing factors to periodontal diseases.^{1,2} The palatal groove is defined as "a developmental groove in a root that, when present is usually found on the lingual aspect of maxillary incisor teeth."^{3,4} Recognition of the palato lingual- groove is critical, especially because of its diagnostic complexity and the problems that may arise if it is not properly interpreted and treated.⁵ The prevalence of PRGs ranges between 2% and 5% with 58% of the grooves featuring a length of more than 5mm. The existence of 18% incidence of PRGs in Chinese population suggest a possible racial link in the etiology.⁶ These roots begin typically in the central fossa area of the incisors, extend over the cingulum and

continue apically down the root surface.^(2,5,6,7,8,9,10) The radicular grooves encountered in maxillary incisors have received several names such as palato gingival groove (Lee et al., 1968) (10,11,12,13,14) radicular development anomaly (Simon et al., 1971)⁶, distolingual groove (Everett and Krammer, 1972)¹⁵, radicular lingual groove (August, 1978)¹, palato- radicular groove⁸, radicular groove, cingulo radicular groove.

This article presents cases of incisors anatomically complicated with palatolingual groove. The management of these teeth was done with an interdisciplinary approach. These case reports describe the diagnosis and management of maxillary incisors with necrotic pulp and localized periodontal destruction, associated with a palatal radicular groove.

CASE REPORTS

CASE I

A 22- yr- old male with good general health reported to the Outpatient department with pain in the upper right front tooth. There was no history of trauma and the medical history was non contributory. On examination, the maxillary right central incisor (#11) had an intact crown without caries or fracture, which was positive to percussion tests but negative on vitality testing (Fig 1A).

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The tooth was Grade II mobile with a pocket depth of 10mm palatally and a normal probing depth facially. The palatal aspect revealed severe gingival recession and the radicular groove starting from the cingulum and extending all along the root (Fig.1B).

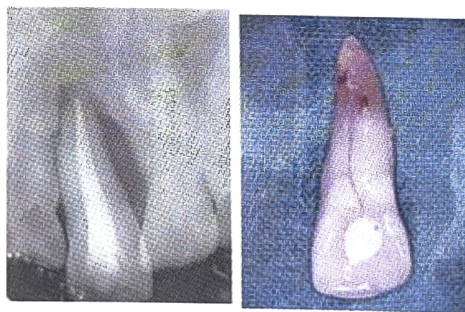


Radiographic examination revealed the presence of periodontal widening with a periodontal defect and severe bone loss in relation to the mesial aspect of the tooth (Fig.1C).



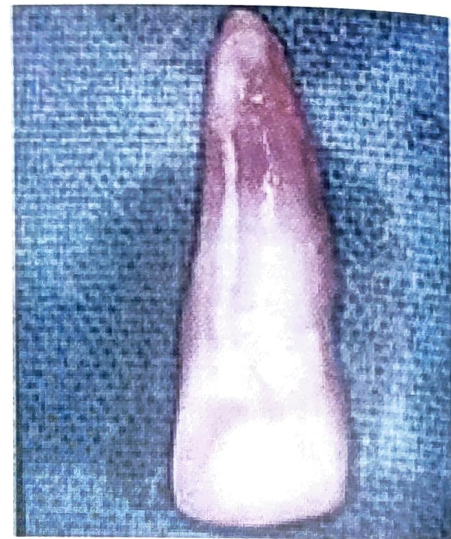
A diagnosis of an endodontic-periodontal lesion was arrived at and an interdisciplinary treatment plan was formulated for the patient. Endodontic treatment was started under rubber dam isolation. Cleaning and shaping was carried out using the crown down technique upto apical file size #55 (Mani Inc, Ulsunomiya, Japan). Canal was debrided by using copious irrigation with sodium hypochlorite (I-Dent, Delhi, India). The final rinse was done with 17% EDTA (PrevestDenpro Limited, Digiana Jammu, India) and the tooth was obturated very carefully with guttapercha and zinc oxide eugenol sealer by using the lateral compaction technique. The access cavity was sealed with Type II glass ionomer cement (GC Corporation, Tokyo, Japan) (Fig.1D).

In the periodontal phase of the therapy the tooth which was mobile in the socket was intentionally removed from the socket (Fig.1E).

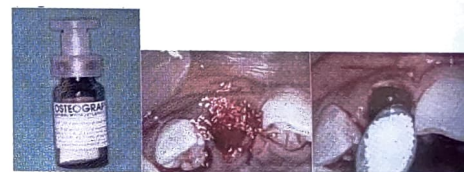


The diseased granulation tissue was curetted out (with Gracey curette number 1, 2 and 5,6; Hu-Freidy Manufacturing Co, Chicago, IL) from the socket to leave the soft tissue more conducive to regeneration. 10% polyacrylic acid was used to condition the

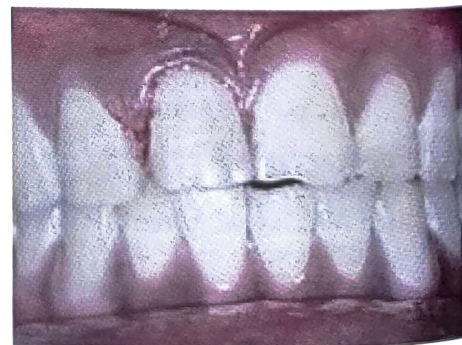
groove and glass ionomer type I (Fuji I; Corporation, Tokyo, Japan) was applied into the defect (Fig.1F).



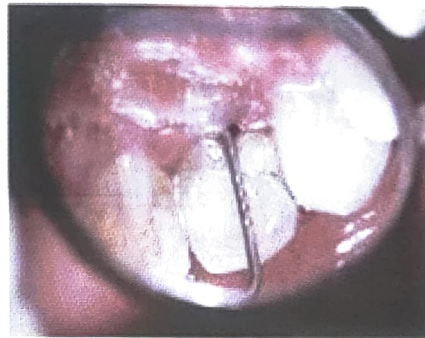
The localized bony defect was filled with bone graft (CeraMed Corporation Limited, USA) (Fig.1G, H, I).



The tooth was then carefully re-implanted back in position taking care not to destroy any intact periodontal ligament fibres (Fig.1J).



The tooth was supported by giving a lingual splint (Fig.1K).



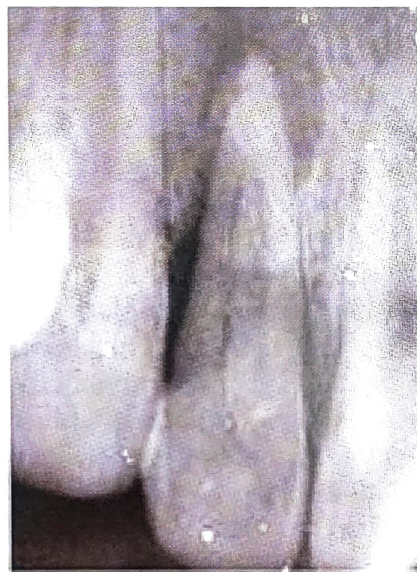
Patient was instructed on post-surgical precautions and maintenance protocol, which included rinsing with 0.2% Chlorhexidine twice a day for 5 weeks. The healing of the periodontium was uneventful. The patient was recalled for professional teeth cleaning and reinforcement of oral hygiene measures.

CASE II

A healthy 27-yr-old male was referred to the Department of Endodontics after the finding of deep periodontal pocket of 7mm palatally associated with maxillary right lateral incisor #22. The patient was unaware of any previous trauma to the maxillary anterior region and had no history of pain in the area. The tooth #22 did not respond to pulp testing while the adjacent teeth responded normally. The patient had no significant tenderness to palpation or percussion in the maxillary anterior area and probing depths were normal, except for a deep and narrow 7mm pocket on the palatal aspect associated with a palatal groove (Fig. 2A).

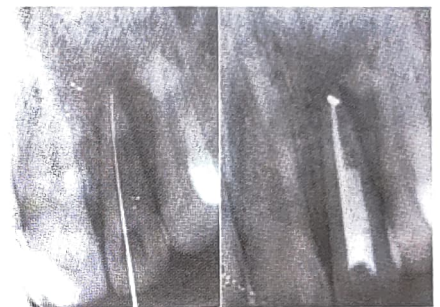
Periapical radiograph revealed an extensive periradicular radiolucency involving the apical two-thirds of the root on the

maxillary right lateral incisor. Two narrow vertically oriented radiolucent lines were also evident on the radiograph (Fig. 2B).

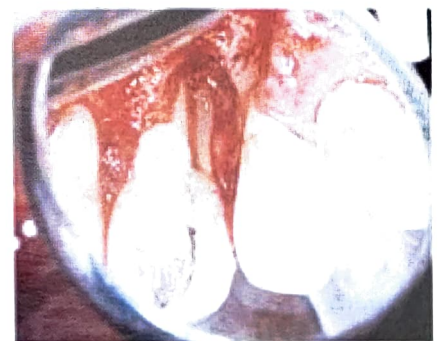


Based on the tests, the diagnosis was necrotic pulp and moderate localized periodontitis secondary to the palatal groove on #22. At this appointment the patient was informed that the tooth #22 had questionable long term prognosis related to the length and depth of the radicular groove and the ability to treat this defect periodontally. Tooth no. #22 was accessed and the root canal was identified. Internally, a C-shaped canal configuration, which corresponded with the invagination of tooth structure caused by the palatal groove, was

noted. After tracing the C-shaped canal system, a second smaller canal was subsequently located. The canals were cleaned and shaped using stainless steel hand files and NiTi rotary instruments. The canals were irrigated with 5.25% sodium hypochlorite and 2% chlorhexidine, rinsed with 17% EDTA and dried with paper points. Obturation was done with gutta-percha and sealer (Fig. 2 C,D).



The access was sealed with silver amalgam. The flap was elevated and the root surface exposed was planed with an ultrasonic scaler and hand curettes. The periradicular groove was conditioned and then sealed with glass ionomer cement (Fig. 2E).

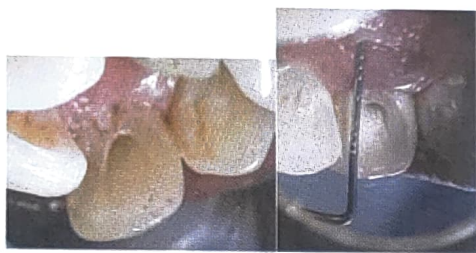


0.12% chlorhexidine gluconate rinse was prescribed and ibuprofen was given for discomfort. Postsurgical healing was excellent with a reduction in pocket depth.

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CASE III

A 24- yr- old male reported with the complaint of pus discharge from the upper front teeth. On clinical examination, a localized gingival inflammation was present with the accumulation of plaque and calculus on tooth no #22. Periodontal examination revealed a deep periodontal pocket of 8mm on the left lateral incisor (Fig. 3A,B).



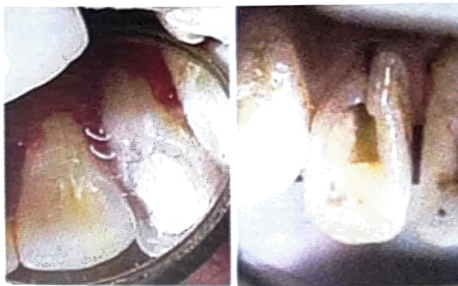
There was no caries or history of trauma. On radiographic examination, a tear- drop shaped radiolucency was present with localized bone loss in relation to #22(Fig.3C).



This gave the suspicion of a palatogingival groove which was clinically present. Endodontic treatment was planned and root canal treatment was done in a manner similar to the above cases (Fig.3D).

This was followed by surgery and the defect was conditioned and sealed with glass ionomer cement

(Fig.3E).



CASE IV

A 24- yr- old male reported with the chief complaint of sensitivity and spacing concerning upper anteriors. The history of chief complaint revealed that the sensitivity was mainly during the consumption of cold food which started about 8 months back and had gradually increased. Pathologic tooth migration which caused increase in spacing between upper anteriors was noticed by the patient for the last 1 month. There was no mobility observed and a pocket depth of 9 mm was present palatally in relation to tooth #12. On further clinical examination of the palatal surface of #12, a fine groove called palato- gingival groove was noticed which started at the cingulum and travelled apically and laterally (Fig. 4A).

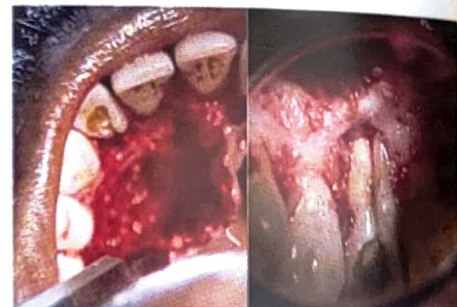
The tooth vitality tests were



negative. Phase I endodontic therapy was first planned and tooth #12 was subjected to root canal treatment (Fig.4A). This

was followed by a decision to perform periodontal surgery in the upper anterior region. After flap elevation root surfaces were scaled and planed (Fig. 4B,C).

The large underlying defect was



exposed. The soft tissue filling the bony defect was removed and submitted for histopathological examination. The palatogingival groove was treated by odontoplasty but the groove was too deep to be totally eliminated. The bony defect was filled with bone graft (CeraMed Corporation Limited USA). The groove was conditioned and sealed with glass ionomer similar to the previous cases. The flap was approximated and sutured back in position(Fig.4D).



Post operative instructions and medications were given. Post surgical healing was excellent and the biopsy report identified the soft tissue removed as "granulation tissue with acute and chronic inflammation".

DISCUSSION

The region in which the lateral incisors are located is considered an area of embryological risk, where a number of malformations may occur: cleft palate, cleft ridge, globulo maxillary cyst, supernumerary teeth, conic teeth, dens in dente and talon cusp. (Mitchell, 1892; Goldstein and Medina, 1974; Gardner and Girgis, 1979; Pecora et al, 1978; Vansen et al, 1990) (1,13,14,16) Radicular grooves are encountered in maxillary incisor roots, mainly in lateral incisors, and this anatomical anomaly favours the instillation of periodontal pockets difficult to treat (Everett and Kramer, 1972; Withers et al., 1981). (1,5,6) These roots begin typically in the central fossa area of the incisors, extend over the cingulum and continue apically down the root surface. (6,7,8,9,10,17) Radicular groove has a similarity to dens invaginatus; however, it differs from it in such a way that dens invaginatus occurs due to an unfolding of the epithelium (resulting in a groove), rather than an invagination (resulting in a circular opening). (18,19)

Lee and colleagues speculated that the palatal groove represents an infolding of the enamel organ and Hertwig's epithelial root sheath. (6,12,18) More recently, Ennes and Lara suggested that the palatal groove could be a result of alteration of genetic mechanisms, rather than dental germ folding. As a result of the cervical location of this anomaly, the palatal groove has the potential to provide a pathway for bacteria to penetrate into the periodontal ligament

area. The groove provides a nidus for progressive inflammation. (6,9,20) The groove can occur on the mesial or distal surface as well as on the facial surfaces of the central incisors, termed as the facial radicular groove. (8,21,22) The groove might vary in depth along the root and it might also communicate with the pulp cavity (23,24) complicating the prognosis. (10,25) With increasing depth of the groove, the thickness of the root cementum increases. The aetiology of PRGs is unknown. Black was the first to describe the PRG as a malformation during embryo development in 1908. (7) The presence of PRG does not always indicate development of pathology. In most cases the epithelial attachment remains intact across the groove. Once the attachment is breached, a self containing pocket forms along the length of the groove or by gingival irritation secondary to microbial plaque retention. The attachment may be breached due to endodontic involvement. (16)

The reason for the multidisciplinary approach was (i) regeneration of periodontal attachment and bone; (ii) cleaning and sealing of the groove to prevent bacterial recolonization; (iii) to evaluate the clinical outcome of palatogingival groove associated periodontal lesion following flap operation with glass ionomer.

In all the above mentioned cases a combined treatment approach was necessary. However, in Cases I and IV, in addition to the conventional surgical procedures graft material; osteograft (natural hydroxyapatite

was also placed in the bony defect because of the size of the osseous defect. A collagen membrane was placed over the defect to provide epithelial exclusion. The combined technique used was able to reduce initial pocket depths of 8-10 mm to 2 mm.

In **Case I**, there was an option to extract the tooth and go in for a replacement, however a more conservative approach was opted for and intentional replantation was attempted followed a lingual splint.

In **Case II**, the cause for pulp necrosis in #22 was not previous trauma since the patient did not give a history. Considering the depth of the groove in this case, the palatal groove could have played a role in the necrosis of the pulp. The groove appeared to have caused the central portion of the pulp to be compressed towards the facial resulting in a C- shaped canal configuration. This suggests that the periodontium adjacent to the deep palatal groove lost its attachment and developed a periodontal defect which over time extended all its way to the root end ultimately resulting in retrogenic pulp infection. (6)

In **Case II**, the periapical radiograph (Fig.2 C) shows a radiolucent line mimicking a lateral canal, communicating from the root canal to the periodontal lesion. This radiolucent line is the parapulpal line representing the palatal radicular groove. Radiculoplasty is recommended to eliminate the groove, which often harbors bacteria and debris leading to a local inflammatory reaction. (20)

clinical section

The prognosis of teeth affected by this anomaly depends on the length, depth and extension of the groove and the extent of periodontal destruction. Teeth with physiologic mobility and shallow grooves located entirely on the crown can be corrected by odontoplasty in conjunction with periodontal treatment including curettage of granulation tissue.(24,26,27)

MTA, Composites and Silver amalgam have been used to restore the palatogingival groove.(28,29) However, the presence of moisture in this area does not make the latter two materials suitable. Although MTA sets in the presence of moisture, it stands a possibility to get washed off from the transgingival defect. Glass ionomer cement does not have this limitation.(17) Conditioning of the groove has been done as it removes the surface debris, increases the wettability and increases the bond strength of the glass ionomer cement.(2) Glass ionomer has been used in all the cases as it has antibacterial effect, chemical adhesion to the tooth structure and good sealing ability.(17,18) Clinical and histological studies have shown that there is an epithelial and connective tissue adherence to the glass ionomer cement during the healing process.(2,17,18)

Depending on the morphology of the PRG, localized periodontitis may develop, accompanied by pathosis. Periodontal pocket depths of more than 5mm and increased dental mobility are typical findings. Moreover in the case of deep PRGs, a retrograde

pulpitis may occur as a result of the so called endodontic-periodontal lesion.(6,17,18) The problem encountered in the management of a tooth with a palatal groove relates to the ability to adequately treat the tooth periodontally and resolve the associated localized periodontal defect.(7) Successful treatment of the PRG depends upon the ability to eradicate inflammatory irritants, by eliminating the groove.(17,18)

CONCLUSION

Differential diagnosis of a PRG are vertical root fracture, consecutive symptoms after a dental trauma, marginal periodontitis, apical periodontitis and endodontic-periodontal lesions. These clinical pictures should be taken into consideration during the diagnosis. Understanding of the pathogenesis of a PRG allows for successful causal therapy.(7) Flap operations with direct glass ionomer restoration is thought to be an acceptable method for favourable results in the treatment of periodontal lesion caused by palato-gingival groove on maxillary lateral incisor.(4) The clinical success of the regenerative procedure in daily practice is based upon the improvement of clinical signs and symptoms. Effective recognition of the PRG's is critical, especially because of their diagnostic complexity and the problems that may arise if they are not properly interpreted and treated. Evaluation of clinical signs and appropriate diagnostic tests are of paramount importance in order to prevent deterioration of attachment of apparatus. Deep radicular

grooves can predispose to pulp necrosis and the establishment of combined endodontic periodontal problems. One should have an eye to recognize the palato gingival grooves early and diagnose their extent and pulpal involvement in order to save the patient from periodontal destruction. Combined endodontic advanced periodontal regeneration treatment modalities can help us to salvage the problems associated with this developmental anomaly and have hope for teeth with extremely poor prognosis.

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