

CASE REPORT

Salvaging a tooth with a deep palatogingival groove: an endo-perio treatment – a case report

N. V. Ballal¹, V. Jothi², K. S. Bhat¹ & K. M. Bhat²

¹Department of Conservative Dentistry and Endodontics; and ²Department of Periodontics, Manipal College of Dental Sciences, Manipal, Karnataka, India

Abstract

Ballal NV, Jothi V, Bhat KS, Bhat KM. Salvaging a tooth with a deep palatogingival groove: an endo-perio treatment – a case report. *International Endodontic Journal*, **40**, 808–817, 2007.

Aim To describe the diagnosis and management of tooth 22 with a necrotic pulp and severe periodontal destruction associated with a deep palatogingival groove extending to the root apex.

Summary Palatogingival grooves are uncommon in maxillary lateral incisors, but when present may contribute to the pathogenesis of periodontal and endodontic lesions. In the present case, the prognosis was considered poor, as the patient presented with a deep probing defect, advanced bone loss and grade III mobility of tooth 22. Root canal treatment was performed, followed by periodontal surgery, during which the groove was conditioned and sealed with conventional glass-ionomer cement and the osseous defect filled with indigenously prepared hydroxyapatite. The 18 month post-operative follow up showed substantial resolution of the osseous defect with gain in attachment and decreased tooth mobility.

Key learning points

• Teeth with deep palatogingival grooves may be significantly compromised with severe periodontal and periapical bone loss.

• Following thorough evaluation, the careful application of endodontic and periodontal surgical procedures may restore satisfactory function.

Keywords: bone graft, glass-ionomer cement, palatogingival groove.

Received 30 September 2006; accepted 29 March 2007

Introduction

Anatomic aberrations are seen often in the human dentition. The maxillary incisor region of the permanent dentition where these anatomical aberrations are commonly seen is considered an area of embryonic hazard. Aberrations affecting the external and internal

Correspondence: Dr N. Vasudev Ballal, Assistent Professor, Department of Conservative Dentistry and Endodontics, Manipal College of Dental Sciences, Manipal – 576 104, Karnataka, India (Tel.: +91-0820-2922440; fax: +91-0820-2570061; e-mail: drballal@yahoo.com).

morphology can at times be the cause of complex pathological conditions involving the pulpal and periodontal tissues and can pose a challenge to the clinician for diagnosis and clinical management. One such anatomical aberration is a developmental groove involving the crown and extending a variable distance onto the root. The palatal surface of the maxillary lateral incisor and labial surface of the maxillary central incisor are most commonly involved. Such developmental grooves affecting maxillary incisors are termed palatoradicular grooves. This anomaly also has been termed radicular anomaly, palatogingival groove, distolingual groove and radicular lingual groove (Prichard 1965, Lee *et al.* 1968, Simon *et al.* 1971, Everett & Kramer 1972). This anomaly can pose dilemmas for diagnosis and clinical management.

A majority of palatoradicular grooves (93.8%) affect maxillary lateral incisors (Everett & Kramer 1972), and may result from an infolding of the enamel organ and the epithelial sheath of Hertwig (Lee *et al.* 1968). Some have suggested that the anomaly results from an attempt to form another root (Lee *et al.* 1968, Peikoff & Trot 1977).

Kovacs (1971) called this anomaly 'syndesmocorono-radicular tooth'. These grooves act as a nidus for plaque accumulation which destroys the sulcular epithelium and later deeper parts of the periodontium, finally resulting in the formation of a severe localized periodontal lesion since proper cleaning of that site is difficult, if not impossible, for the patient. These grooves may also lead to combined endodontic-periodontal lesions, since there might be a communication between the pulp canal system and the periodontium through accessory canals. The prognosis of teeth affected by this anomaly depends upon the depth and extension of the groove. Shallow grooves may be corrected by odontoplasty in conjunction with periodontal treatment. However, when the groove is more advanced, treatment of the teeth is almost always doomed to failure either because of pulpal or periodontal breakdown.

A case is presented of a maxillary lateral incisor with a deep palatoradicular groove extending up to the root apex with severe periodontal destruction. Despite an apparently poor prognosis, the tooth was successfully managed by endodontic and surgical periodontal therapy. The rationale behind treatment modalities is discussed.

Case report

A 48-year-old female presented with the complaint of discharge of pus and mobility in relation to tooth 22 for the preceding 3 months. On clinical examination, pus discharge was present through the palatal gingival sulcus, and there was a draining sinus tract on the adjacent labial alveolar mucosa. There was a deep palatoradicular groove in relation to the same tooth (Fig. 1), extending deeply and associated with a 10 mm probing defect (Fig. 2). The tooth exhibited grade III mobility, oral hygiene was fair, and the patient had an open bite with class-I molar relationship. Maxillary left and right central incisors had proximal caries.

The underlying periodontal condition was unremarkable, and the medical history was noncontributory. An intraoral periapical radiograph revealed a periapical lesion with an advanced bony defect extending up to the apical third of the root (Fig. 3). Since bilateral occurrence of the palatoradicular groove is possible, tooth 12 was also examined, but no evidence of a palatoradicular groove was found after sulcular probing and radiography. Vitality testing of tooth 22 with an electronic pulp tester (Parkell Electronics Division, New York, USA) revealed a negative response, confirming the diagnosis of a nonvital pulp. Gutta-percha tracing into the sinus tract and periodontal pocket revealed the communication with the periapical area confirming chronic supperative apical periodontitis (Fig. 4). The bony lesion appeared to be a combined endo-perio problem.

A treatment strategy was planned that comprised supra and sub-gingival scaling with root debridement followed by root canal treatment and periodontal surgery for pocket elimination and groove repair. Class IV cavities were restored in teeth 11 and 21.



Figure 1 Pre-operative view of the deep palatoradicular groove.



Figure 2 Deep periodontal pocket associated with the groove.

A composite and wire splint was placed to stabilize tooth 22, and instructions were given on plague control methods. Endodontic access was prepared under rubber dam and the canal orifice explored. There was a single, straight canal without morphological alterations visible to the naked eye. Necrotic pulp tissue was extirpated, working length determined and intracanal calcium hydroxide placed. Root canal treatment was completed 5 days later, by which time the sinus tract had healed. Canal preparation was undertaken with K files (MANI Inc., Tochigi City, Japan), to size 40 apically and stepping back to size 55. The root canal was filled by cold lateral and warm vertical compaction of gutta-percha cones and AH plus sealer (Dentsply Maillefer, Ballaigues, Switzerland). The access cavity was sealed with glass-ionomer cement (Fuji II; GC Corporation, Tokyo, Japan) and the patient was reviewed after 1 week, when periodontal flap surgery was performed to eliminate the pocket. A full thickness mucoperiosteal flap was reflected on the palatal aspect of the maxillary left lateral incisor. On reflection, an advanced circumferential bony defect, which surrounded the palatal and distal aspect of lateral incisor was found. Granulomatous tissue was removed from the bony defect and the palatoradicular groove was traced to the apex (Fig. 5).

Following root-planing, the groove was conditioned with 10% polyacrylic acid, isolated with cotton pledgets and sealed with glass–ionomer cement (Fuji I; GC Corporation) using a right-angled explorer.



Figure 3 Periapical lesion with advanced bony defect.

Hydroxyapatite graft material (Perio Bone G; Top Notch-Health Care Products, Aluva, Kerala, India) was mixed with saline and placed into the deep bony defect (Fig. 6). The flap was readapted and stabilized with sling sutures and the wound site covered with noneugenol periodontal dressing (Coe pak; GC Inc., Alsip, IL, USA). During the surgical procedure, the composite wire splint was displaced and was readapted after the completion of the periodontal surgery. Hence, the splint is not visible in the surgical photographs (Figs 5 and 6).

The nonsteroidal anti-inflammatory drug, Ibuprofen 400 mg (Dolomed-Comed Chemicals Limited, Chennai, India) was prescribed three times a day for 3 days and chlorhexidine mouth rinse (Clohex 0.2%; Dr Reddy's Lab, Hyderabad, India) twice a day, for a week. One week following surgery, the dressings and sutures were removed. Healing after surgery was uneventful. The patient was recalled at the third, sixth, 12th and 18th month post-operatively, during which radiographs were taken for evaluation of the endodontic and periodontal status (Figs 7–9).

After 3 months, the pocket probing depth had reduced from 10 to 5 mm and between 6 and 18 months it remained at 4 mm (Fig. 10). There was no exudate or bleeding on probing.

Discussion

Palatoradicular groove is a rare developmental anomaly with a prevalence of 2.8–8.5% (Everett & Kramer 1972, Withers *et al.* 1981). This range represents different occurrences in different populations and sub-populations. The occurrence of grooves extending from cingulum to apex, as in this case, appears to be extremely rare (Everett & Kramer 1972).



Figure 4 Gutta-percha tracing through the sinus tract.



Figure 5 Palatoradicular groove extending up to the apex.

Although rare, the clinical implications are important, since such grooves may lead to combined endodontic periodontal lesions. In the past, combined endodontic-periodontal lesions of this sort were often untreatable by any means other than extraction (Simon *et al.* 1971, Withers *et al.* 1981). These grooves usually begin in the central fossa, cross the cingulum and extend to various distances, depths and directions along the root. The 'fold' usually extends as a twisting defect into the surface of the root to a depth of 2–3 mm, and may present radiographically as a radiolucent parapulpal line. However, this was not seen in the present case.



Figure 6 Graft placement into the defect.



Figure 7 Post-operative radiograph after 3 months.

The prognosis of a tooth with a palatoradicular groove depends mainly on the location and extension of the groove. When the groove is entirely located in the crown of the tooth, terminating at the CEJ and when it is shallow, the prognosis can be estimated as good since there will be neither a deep bony defect nor pulpal damage. Simple treatment, including curettage of granulation tissue, improvement of oral hygiene and sometimes elimination of the groove by means of saucerization may be considered. Saucerization involves elimination of the defect to the crestal bone level with rotary cutting and polishing instruments. It has been a helpful method in eliminating shallower grooves (Meister *et al.*

© 2007 International Endodontic Journal



Figure 8 Post-operative radiograph after 6 months.

1983, Robison & Cooley 1988, Jeng *et al.* 1992). However, when grooves are deeper, treatment is almost always doomed to failure.

Dysplastic radicular dentine with numerous clefts is often encountered along the length of the defect, whilst in deeply invaginated cases, there may be a groove with entrapped enamel within a blind 'cul-de-sac' (Everett & Kramer 1972). For these anatomical reasons, the palatoradicular groove is an ideal 'plaque trap' for promoting periodontal breakdown and pulpal necrosis due to the tracking of micro-organisms to the root apex. Accessory canals connecting to the pulp in the depth of the grooves which may lead to bacterial ingress to the pulp space have been reported (Gao *et al.* 1989). This is the probable cause for the pulpal infection of the tooth in the present case and hence, the root canal treatment was performed. Similarly, since the groove extended to the apex, it also could have contributed to the apical pathosis. Successful treatment of this particular type of palatoradicular groove (Brunsvold 1985, Friedman & Goultschin 1988). However, in this case, since the groove was deep and extensive, it was conditioned and sealed with glass–ionomer cement.

This technique of conditioning and sealing the groove with luting glass-ionomer cement was not reported before. It is a very conservative approach for eliminating deep palatoradicular grooves. Conditioning of the groove removes the surface debris, increases the wettability and increases the bond strength of glass-ionomer cement (Powis *et al.* 1982, Barakat & Yamaguchi 1988). Glass-ionomer cement (Fuji I) was used, since it has an antibacterial effect, chemical adhesion to the tooth structure and good sealing ability



Figure 9 Post-operative radiograph after 18 months.



Figure 10 Post-operative view of reduced pocket depth (mirror view image).

(Maldonado *et al.* 1978, Vermeersch *et al.* 2005). Clinical and histological studies have reported that there is an epithelial and connective tissue adherence to glass-ionomer cement during the healing process (Dragoo 1997). The same clinical observation was also found in this case. In the present case, since the groove was extended onto the root surface with substantial periodontal destruction, a flap procedure, including curettage of granulation tissue and root planing, was undertaken. Since there was an advanced circumferential bony defect, a hydroxyapatite bone graft was placed to promote bone

regeneration. The graft is a synthetically prepared ceramic material in the form of granules, which has a pore size ranging from 200 to 300 μ m and is referred to as the Chitra Granules (Sri Chitra Tirunal Institute for Medical Sciences and Technology, Trivandrum, India) where the material was originally developed. It has been shown to have good bone regeneration potential (Rajesh *et al.* 1998). In the present case also, the Chitra granules showed good bone regeneration along the root surface. It is also more economical compared with other bone grafts.

Studies have reported that inadequacy of the coronal seal leading to microleakage can be one of the reasons for the failure of the root canal treatment. Glass-ionomer cement has been found to be a good access cavity sealing material (Maldonado et al. 1978). Thus, after the root canal treatment, the restoration of the access cavity was completed with glass-ionomer cement. A composite wire splint was placed up to 1 year, to stabilize the tooth. Since a wire splint had more strength than an aesthetic splint, and the patient was not aesthetically sensitive, the composite wire splint was placed. Studies reported that teeth undergoing periodontal surgery had a more favourable healing response with the gain of connective tissue attachment when occlusal trauma was relieved (Ericsson & Lindhe 1984). This might be one of the probable factors in satisfactory healing in the present case, since the patient had an anterior open bite. Eighteen months after the root canal treatment and periodontal surgical procedure, the probing pocket depth was reduced from 10 to 4 mm, and the radiograph taken at this appointment showed satisfactory osseous-healing. Mobility was decreased from grade III to grade I. In the intraoral radiograph at 18 month post-treatment, there appeared to be a radiolucency in the periapical area of tooth 22. This was due to the reduced contrast of the radiograph, and not a true periapical lesion. A long-term follow up of this case is however required.

Conclusion

This case reported the successful management of a pulpo-periodontal lesion precipitated and complicated by the presence of a deep palatoradicular groove whose prognosis was graded to be poor. Appraisal of the signs and the correlation of the diagnostic tests were of paramount importance in arriving at a diagnosis and appropriate management.

- The key factors which may have contributed to the success of this case are
- effective root canal treatment with good coronal seal;
- periodontal attachment facilitated by the elimination of the groove;
- · minimum tooth contact because of anterior open bite;
- · placement of bone graft into the osseous defect;
- periodontal maintenance.

Disclaimer

Whilst this article has been subjected to Editorial review, the opinions expressed, unless specifically indicated, are those of the author. The views expressed do not necessarily represent best practice, or the views of the IEJ Editorial Board, or of its affiliated Specialist Societies.

References

Barakat MM, Yamaguchi R (1988) Parameters that effect in vitro bonding of Glass-ionomer cement liners to dentin. *Journal of Dental Research* **67**, 1161–3.

Brunsvold MA (1985) Amalgam restoration of palatogingival groove. General Dentistry 33, 244-6.

- Dragoo MR (1997) Resin ionomer and hybrid ionomer cements: Part II. Human clinical and histologic wound healing responses in specific periodontal lesions. *International Journal of Periodontics and Restorative Dentistry* **17**, 75–87.
- Ericsson I, Lindhe J (1984) Lack of significance of increased tooth mobility in experimental periodontitis. *Journal of Periodonotology* **55**, 447–52.
- Everett FG, Kramer GM (1972) The distolingual groove in the maxillary lateral incisor: a periodontal hazard. *Journal of Periodontology* **43**, 352–61.
- Friedman S, Goultschin J (1988) The Radicular palatal groove- a therapeutic modality. *Endodontics and Dental Traumatology* **4**, 282–6.
- Gao ZH, Shi J, Wang Y, Gu F (1989) Scanning electron microscope investigation of maxillary lateral incisor with a radicular lingual groove. *Oral Surgery, Oral Medicine, Oral Pathology* **68**, 462–6.
- Jeng JH, Lu HKJ, Hou LT (1992) Treatment of an osseous lesion associated with a severe palatoradicular groove: a case report. *Journal of Periodontology* **63**, 708–12.
- Kovacs I (1971) A systemic description of dental roots. In: Dhalberg AA, ed. *Dental Morphology and Evolution. Chicago, IL: University of Chicago Press,* pp. 223–5.
- Lee KW, Lee EC, Poon KY (1968) Palato-gingival grooves in maxillary incisors. *British Dental Journal* **124**, 14–8.
- Maldonado A, Swartz ML, Phillips RW (1978) An in vitro study of certain properties of glass-ionomer cement. *Journal of American Dentistry* 96, 785–91.
- Meister F, Keating K, Gerstein H, Mayer JC (1983) Successful treatment of a radicular lingual groove: case report. *Journal of Endodontics* **9**, 561–4.
- Peikoff MD, Trot JR (1977) An endodontic failure caused by an unusual anatomical anomaly. *Journal of Endodontics* **3**, 356–9.
- Powis DR, Folleras T, Marsen SA, Wilson AP (1982) Improved adhesion of glass–ionomer cement to dentin and enamel. *Journal of Dental Research* **61**, 1416–22.
- Prichard JS (1965) Advanced Periodontal Therapy. Philadelphia, PA: WB Saunders Co.
- Rajesh KS, Mohanty M, Verma BRR, Bhat KM (1998) Efficacy of Chitra granules and powder (hydroxyapatite) in Alveolar Bone Regeneration in rabbits. A histological evaluation. *Indian Journal of Dental Research* 9, 59–65.
- Robison SF, Cooley RL (1988) Palatogingival groove lesions: recognition and treatment. *General Dentistry* **36**, 340–2.
- Simon JH, Glick DH, Frank AL (1971) Predictable endodontic and periodontal failures as a result of radicular anomalies. *Oral Surgery, Oral Medicine, Oral Pathology* **31**, 823–6.
- Vermeersch G, Leloup G, Delmee M (2005) Antibacterial activity of glass-ionomer cement, compomers and resin composites: a relationship between acidity and material setting phase. *Journal of Oral Rehabilitation* **32**, 368–74.
- Withers JA, Brunsvold MA, Killoy WJ, Rahe AJ (1981) The relationship of palatogingival grooves to localized periodontal disease. *Journal of Periodontology* **52**, 41–4.

This document is a scanned copy of a printed document. No warranty is given about the accuracy of the copy. Users should refer to the original published version of the material.