Endodontic-periodontal management of a maxillary lateral incisor with an associated radicular lingual groove and severe periapical osseous destruction – a case report

Précis
Radicular lingual grooves are morphological defects that can create periodontal and pulpal pathology, but they may be difficult to identify as an aetiological factor. This article discusses their presentation and management.

Abstract
Radicular lingual grooves are morphological defects, which are found most frequently in maxillary anterior teeth and are a predisposing factor for periodontal disease. They are easily overlooked as aetiologic factors, as these grooves are covered by periodontal tissues. This case report presents a successful management of a case of a maxillary lateral incisor with an associated radicular lingual groove and severe periapical osseous destruction in a 30-year-old female patient. A combination of endodontic treatment, radiculoplasty to eliminate the radicular lingual groove, and periapical surgery to eliminate the periapical osseous defect was used. At two-year follow-up, the patient was comfortable and complete resolution of the periapical pathology was evident.

Key words: maxillary lateral incisor, periapical surgery, radicular lingual groove.

Introduction
The radicular lingual groove (RLG) is a developmental anomaly in which an infolding of the inner enamel epithelium and Hertwig’s epithelial root sheath (HERS) creates a groove that passes from the cingulum of maxillary incisors apically onto the root.¹ Radicular lingual grooves have also been termed palatal radicular grooves,¹ distolinguval grooves,² palato-gingival grooves,³ radicular grooves² and vertical development grooves.¹⁴ The aetiology of the groove is not fully understood. Some clinicians believe that the groove originates with alteration in the growth of inner enamel epithelium and HERS.² According to some authors, the RLG is embryologically related to dens invaginatus.⁵,⁶ Ennes and Lara suggested that the RLG could be the result of an alteration of genetic mechanisms.⁷ Other investigators claim that this malformation results from an incomplete attempt of the tooth to form another root.⁵,⁶
RLGs can create periodontal and pulpal pathology. The presence of an RLG does not always indicate the development of pathology. In most cases the epithelial attachment remains intact across the groove, and the periodontium remains healthy. Once the attachment is breached, however, a self-containing periodontal pocket forms along the length of the groove. The attachment may be breached due to endodontic involvement. Inflammation can progress from an apical lesion coronally along the groove, causing a primary endodontic/secondary periodontic lesion. Conversely, the epithelial attachment may be breached due to the accumulation of bacterial plaque and calculus on the irregular external surface of the groove resulting in onset and progression of periodontal disease. As a result of this breach in the epithelial attachment, the progression of bacterial products through dentinal tubules could secondarily compromise the pulp tissue, causing a primary periodontic/secondary endodontic lesion.

Goon (1991) classified RLGs as simple and complex. Simple RLGs do not have communication with the pulp and terminate at the cemento-enamel junction. The complex RLGs have direct communication with the pulp and extend to various lengths along the root. In rare cases, the most complex forms occur as deeply invaginated defects that separate as an accessory root from the main root trunk. The clinical significance of RLG is related to the incidence of localised periodontitis with or without pulpal pathosis, depending on the depth, extent and complexity of the groove. Accurate diagnosis and elimination of the inflammatory irritants and other contributory factors are extremely important in achieving successful treatment outcome. This report presents a successful endodontic and periodontal management of a maxillary lateral incisor with an associated RLG and severe periapical osseous destruction.

Case report
A 30-year-old female patient reported to the Department of Conservative Dentistry and Endodontics at Prabhu Dayal Memorial (PDM) Dental College and Research Institute, Bahadurgarh, Haryana, India, with a chief complaint of mobility and discharge of pus in the upper anterior region for ten days. Clinical examination revealed a fistulous tract on the labial gingival surface adjacent to the maxillary left lateral incisor. There was no history of trauma and/or discoloration of the tooth. Medical history was noncontributory. The maxillary left lateral incisor did not respond to electric and thermal pulp testing, whereas testing of adjacent and contralateral teeth elicited normal responses. On further clinical examination, a groove was noted on the lingual surface of the maxillary left lateral incisor extending subgingivally from the cingulum and a 6mm periodontal pocket was associated with the groove.

An intra-oral periapical radiograph revealed a large periapical radiolucency and the presence of a localised lateral periodontal defect around the maxillary left lateral incisor. Apical periodontal widening was also evident. Based on the clinical and radiographic findings, a diagnosis of an endo-perio lesion of the maxillary left lateral incisor associated with an RLG was made. The treatment plan consisted of conventional root canal treatment, radiculoplasty of the RLG, and periapical surgery to eliminate the periapical osseous defect.

Management
A decision to endodontically treat the tooth followed by periapical surgery was made, and informed consent was obtained from the patient. After prophylaxis and removal of localised calculus, the tooth was anaesthetised with 2% lidocaine with 1:100,000 epinephrine, and
A rubber dam was applied. The endodontic access cavity was prepared on the palatal surface by using a no. 2 round bur (Mani; Tochigi, Japan) and the canal orifice was found. Working length of the canal was determined with the help of an electronic apex locator (Root ZX; Morita, Tokyo, Japan) and then confirmed by a radiograph. This was followed by cleaning and shaping of the canal with Gates Glidden drills (numbers 3 and 2; Dentsply Maillefer) and nickel titanium hand files up to an apical file size 50 (Dentsply Maillefer, Ballaigues, Switzerland). Copious irrigation with 2.5% sodium hypochlorite was done at every step of instrumentation. The canal was dried using sterile paper points, following which calcium hydroxide (Ultracal XS; Ultradent, South Jordan, UT, USA) was placed as an intracanal medicament and the access cavity was sealed with Cavit G (3M ESPE, Seefeld, Germany).

The patient was recalled after one week and canal filling was completed with cold lateral compaction using gutta-percha and Roth sealer (Roth drug Co., Chicago, IL; Figure 3). The access cavity was restored with light-cured composite resin (P60; 3M Dental Products, St Paul, MN). The patient was recalled after intervals of two, four, eight and 12 weeks. During these phases of intervals it was seen that the patient had become symptomatic and there was no evidence of healing of the sinus. It was further seen that at the interval of 12 weeks there was no reduction in the size of the periapical lesion. Based on these observations, it was decided to opt for periapical surgery in combination with curettage of the lateral periodontal defect.

During the surgical phase, a full-thickness flap was reflected on both labial and palatal aspects to expose the lesion. The reflected flap on the labial surface revealed a bony fenestration corresponding to the location of the previously existing sinus tract (Figure 4). On the palatal side, the RLG emerged from the cingulum, ran apically and distally, and finally terminated at the middle third of the root (Figure 5). The window into the lesion on the labial aspect was enlarged, and the soft tissue contents were removed (Figure 6). With the help of an air-driven surgical handpiece (Impact Air; Palisade Dental), the apical root end was resected and sealed by burnishing the gutta-percha. On the palatal aspect, thorough scaling and root planing were performed over the groove and the bony defect, and granulation tissue was debrided (with Gracey curette number 1, 2; Hu-Friedy Manufacturing Co, Chicago, IL, USA). Saucerisation of the groove by grinding it out

[FIGURE 4: Clinical view after reflection of a labial full-thickness flap, revealing the periapical lesion, as shown by arrow.]

[FIGURE 5: Clinical view after reflection of a palatal full-thickness flap, revealing the extent of the radicular lingual groove.]

[FIGURE 6: Lesion was curetted. Notice the extent of the bony defect with intact palatal bone.]
to its depth using a small round diamond bur was performed. This was followed by conditioning the groove with 10% polyacrylic acid and sealing the defect with glass ionomer cement (FUJI II; GC Corporation, Tokyo, Japan; Figure 7). Surgical haemostasis during setting of the glass ionomer cement was achieved by using a haemostatic gelatin sponge (Pfizer Inc, New York, USA).

After the cement had hardened, the bony defect was filled with a bone graft (Ossifi; Equinox medical technologies, Netherland, Holland; Figure 8) and the flaps were reapproximated and sutured (Figure 9). This was followed by coe-pak application (GC America, Alsip, IL, USA). A postoperative radiograph was taken after closure of wounds (Figure 10). A non-steroidal anti-inflammatory drug, Voveran SR 100mg (twice daily for three days) and a mouthwash containing 0.2% chlorhexidine gluconate (twice a day for four weeks) were prescribed postoperatively. Healing was uneventful and sutures were removed seven days postoperatively. At three months’ follow-up, the patient was asymptomatic, the sinus tract had closed, and probing depth was significantly reduced. A two-year postoperative radiograph revealed complete resolution of periapical radiolucency and normal periodontal probing depth (Figure 11).

Discussion

The treatment of RLG presents a clinical challenge, as the long-term prognosis depends on the length, depth and complexity of the groove. Teeth with physiologic mobility and shallow grooves might be corrected by odontoplasty in conjunction with periodontal treatment including curettage of granulation tissue. However, when the groove is more advanced and associated with extensive periodontal destruction, the treatment of the teeth is complex. Elimination of the groove and appropriate treatment of the periodontal defect would reduce inflammatory irritants, thus favourably influencing the prognosis of such teeth.

Simon et al. described two types of endo-perio lesions in teeth involved with RLG. Primary endodontic lesion with secondary periodontal involvement and primary periodontic lesion with secondary endodontic involvement depend upon whether pulpal pathosis occurred prior to periodontal destruction or vice versa. The endo-perio lesion in the present case seems to be a primary periodontic lesion with secondary endodontic involvement. This was because of the fact that there was no history of trauma and/or discoloration of the tooth. Moreover, surgical opening of the RLG did not reveal carious involvement of the groove.

The groove had a funnel-like shape and irregularities on the external surface that promoted the accumulation of bacterial plaque and calculus, resulting in the onset and progression of periodontal disease. As a result of this breach in the epithelial attachment, the progression of bacterial products through dentinal tubules could secondarily compromise the pulp tissue, causing a primary periodontal/secondary endodontic lesion, which necessitated both pulpal and periodontal therapy, as conventional endodontic treatment alone will not be effective, because the bacterial aetiology is residing extra radicularly, as a self-sustaining lesion.

Radiculoplasty was performed to eliminate the groove, which often harbours bacteria and debris leading to local inflammatory reaction. Root planing was performed as it encourages sulcular re-attachment and prevents bacteria from gaining access to the groove at a deeper level.

The success of periapical surgery depends on regeneration of the periapical tissues and filling of osseous defects. In the present case a bone graft material, Ossifi™ (Equinox Medical Technologies, Holland) was used.
was used to fill the osseous defect. It is a synthesised combination of hydroxyapatite and -tricalcium phosphate in a 70/30 ratio, and has calcium phosphate in its purest form. This molecule remains constant throughout the whole process of resorption and bone formation, reducing the risk of cavities of fibrous ingrowth. It has a bioceramic matrix that is extremely biocompatible and highly osteoconductive. This graft was selected to fill the bony defect as it only occupies 10% of the defect space, leaving 90% of the space for regeneration of new bone. The pore size of this material is highly reproducible and constant. This reproducible interconnected porosity combined with a large granular inner surface area provides the highest degree of osteoconductivity through clot stabilisation, vascularisation, cell adhesion and penetration of host bone repair into the inner part of the graft material. The post-surgical results obtained in the present case, both clinically and radiographically, showed predictable clinical outcome. Complete periapical healing was evident on the radiograph over a period of two years. The results of the present case were similar to those achieved in previous studies. Several materials, such as composite and amalgam, have been used to fill the RLG. Friedman and Goultschin salvaged a tooth by placing amalgam into a grooved root that was refractory to extensive periodontal procedures. This apparently eliminated the pathway for bacterial ingress along the groove and the symptoms abated with time. Torabinejad et al. developed a new cement, mineral trioxide aggregate (MTA). MTA is the only material that is unaffected by moisture or blood contamination. MTA is considered today to be the material of choice for closing open apices, repairing perforations, and sealing the retro-preparations in surgical endodontics. As MTA has low compressive strength, it should not be placed in functional areas and in the present case MTA was not used to seal the groove, as it might get washed off from the transgingival defect. Instead, glass ionomer cement was chosen, as it does not have this limitation. It also has the advantage of having antibacterial action, biocompatibility, adequate sealing ability, and promotion of epithelial and connective tissue attachment. Moreover, it bonds to tooth structure by chemical adhesion.

Conclusion
RLGs can initiate periodontal and pulpal involvement that can be difficult to diagnose and manage. However, if clinicians are aware of the forms in which the condition may occur and can apply the treatment modalities in a proper way, a number of teeth with RLGs may be saved. In the present case, in a two-year follow-up, the patient was asymptomatic, the sinus tract had closed, there was a 3mm non-bleeding sulcus and signs of bone deposition radiographically, suggesting active healing of the periodontal ligament attachment and alveolar bone.

References