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CASE REPORT

Effective Management of a Perio-endo Lesion associated with Palatoradicular Groove

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ABSTRACT

This case report highlights the effective management of a maxillary lateral incisor with perio-endo lesion precipitated and complicated by the presence of a deep palatoradicular groove extending up to the root apex. Despite an apparently poor prognosis, the tooth was successfully managed by a collaborative endodontic and surgical periodontal therapy. The periodontal ligament attachment and periradicular healing were appreciated both clinically and radiographically at 3-month follow-up.

Keywords: Bone graft, Mineral trioxide aggregate, Palatoradicular groove, Periodontal regeneration, Perio-endo lesion.

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INTRODUCTION

Palatoradicular groove (PRG) is a developmental anomaly that originates near the cingulum of the tooth and runs down the cementoenamel junction in apical direction, terminating at various depths along the root. The prevalence rate of PRG has been reported to be 2.8 to 8.5%, with highest predilection (93.8%) along the palatal surface of maxillary lateral incisors.[1-4] Even though Oehlers[5] in 1958 described this anomaly for the first time as radicular invagination, the term groove was formulated by Lee et al[6] in 1968. Synonyms of this radicular anomaly include PRG,[1] radicular lingual groove,[7,8] coronoradicular groove,[9] cinguloradicular groove,[10] palatogingival groove,[6,11] distolingual groove,[4] interruption groove,[12] etc. Kovacs[13] hailed this anomaly "syndesmocoronoradicular tooth."

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The depth of the groove acts as a haven for microorganisms. The palatal occurrence occults the radicular groove, creating a susceptible nidus for bacterial plaque accumulation, which destroys the sulcular epithelium and later deeper parts of the periodontium, subsequently resulting in localized periodontitis, until the patient presents with advanced periodontal pathosis and secondary pulpal involvement. The clinical significance of PRG is related to the incidence of localized periodontitis with or without pulpal pathosis, depending on the depth, extent, and complexity of the groove.[14]

Various authors have proposed theories on the etiology of PRGs. According to Lee et al,[6] it is a mild form of dens invaginatus, probably caused by infolding of the enamel organ and the epithelial sheath of Hertwig during odontogenesis. Some authors speculated that it is the incomplete or aborted attempt of a tooth to form another root.[15,16] Ennes and Lara[17] suggested an alteration of genetic mechanism and racial link has also been proposed as possible etiologies.[1]

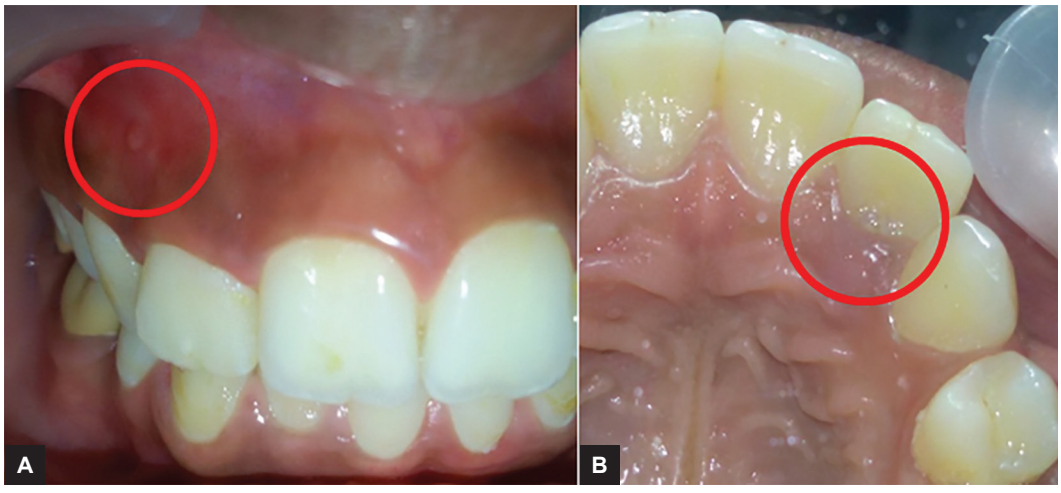
Goon et al[18] classified PRGs into two types, simple and complex. The simple PRG does not communicate with the pulp and represents a partial infolding of Hertwig's epithelial root sheath, while complex PRG communicates directly with the pulp and groove and extends the entire length of the root.

Gu,[19] according to the degree of severity based on microcomputed tomography studies, has classified PRGs into three types: In type I, the groove is short (not beyond the coronal third of the root); in type II, the groove is long (beyond the coronal third of the root) but shallow, corresponding to a normal or simple root canal; in type III, the groove is long (beyond the coronal third of the root) and deep, corresponding to a complex root canal system.

This case report highlights the effective management of a maxillary lateral incisor with a deep PRG extending to the root apex with advanced periodontal destruction. Despite an apparently poor prognosis, the tooth was successfully managed by combined endodontic and surgical periodontal therapy. The rationale for this treatment modality is also discussed.

CASE REPORT

A 21-year-old female presented with the complaint of dull, intermittent pain, discharge of pus, and mobility in



Figs 1A and B: Preoperative view: (A) Labial; and (B) palatal

relation to upper right lateral incisor for the preceding 3 weeks.

Patient gave no history of trauma or previous orthodontic treatment. Medical and drug history was noncontributory.

On clinical examination, the crown of 12 was intact with no caries, cracks, or fractures. The marginal gingiva was inflamed on the labial aspect and bled slightly on probing (Fig. 1A). On the palatal aspect, a notch was detected near the cingulum, the marginal gingiva was inflamed (Fig. 1B), and there was a deep PRG in relation to the same tooth extending deeply and associated with a 10 mm deep isolated probing defect (Fig. 2).

There was a draining sinus tract on the labial alveolar mucosa of 12 (Fig. 1A). Gutta-percha tracing into the sinus tract and periodontal pocket revealed the communication with the periapical area confirming chronic suppurative apical periodontitis. The bony lesion appeared to be a combined perio-endo problem.

An intraoral periapical radiograph revealed a patent root canal with another parapulpal radiolucent line and a periapical lesion with an advanced bony defect extending up to the apical third of the root (Figs 3A and B).

The history, clinical, and radiographic findings supported a diagnosis of apical periodontitis associated with PRG in relation to 12.

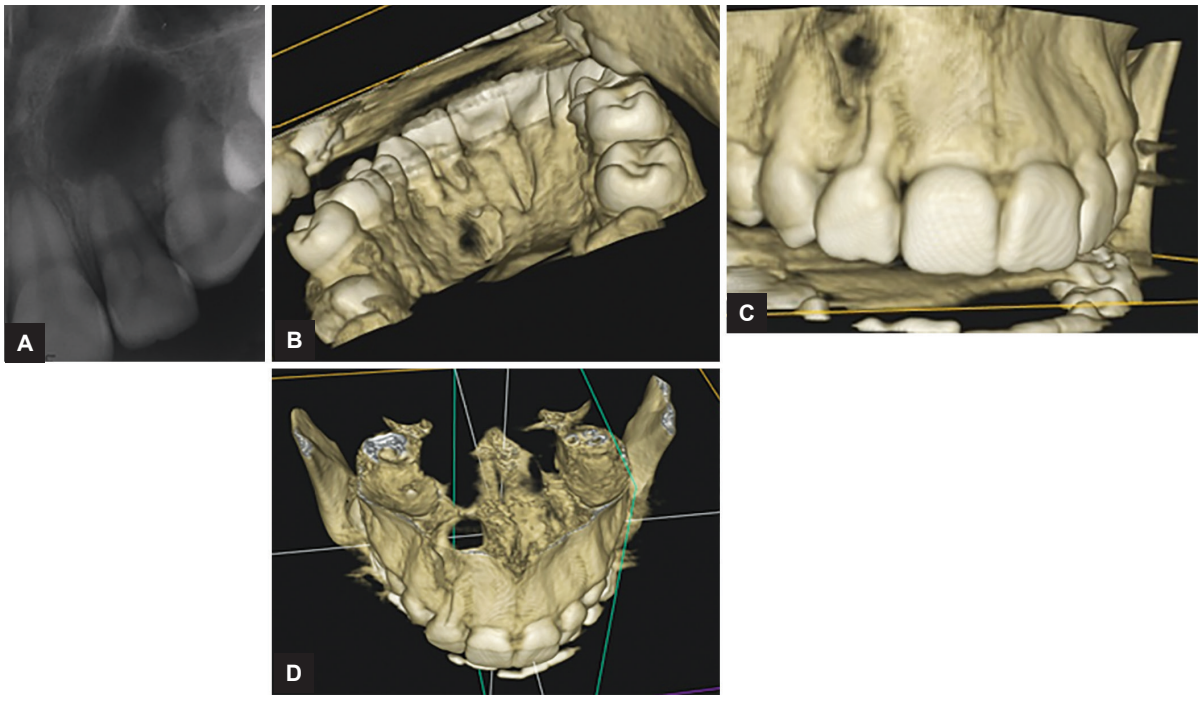
Since bilateral occurrence of PRG is possible, tooth 22 was also examined, but no evidence of a PRG was found after sulcular probing and radiography. Vitality testing of tooth 12 with thermal and electronic pulp testing (Parkell Electronics Division, New York, USA) revealed a negative response, confirming the diagnosis of a nonvital pulp, and positive response on vertical percussion.

After obtaining the approval of patient, a cone-beam computed tomography (CBCT) scan was made to assess the extent and depth of lesion, to aid in modifying the treatment plan to a more conservative strategy. Cone-beam computed tomography demonstrated the complex anatomy of tooth 12 and showed that the groove extended till the root apex, and there was communication between the pulp canal space and the periodontium. It also revealed the volume of bone loss (Fig. 3B).

A treatment strategy was planned that comprised collaborative endodontic and periodontal management. Patient was advised to meticulously maintain the oral hygiene.

After prophylaxis and removal of local factors, endodontic access was prepared under rubber dam isolation (Fig. 4A). Necrotic pulp tissue was extirpated and working length was determined (Fig. 4B). Chemomechanical preparation was done using K files (MANI Inc., Tochigi City, Japan) to size 50 apically. A low concentration of 2.5% warm sodium hypochlorite (NaOCl) was used as irrigating solution in conjunction with 17% ethylenediaminetetraacetic acid solution, which was ultrasonically agitated passively for 2 minutes, and 2% chlorhexidine was used as final rinse. Canal was dried with absorbent points

Fig. 2: Isolated deep pocket measuring 10 mm

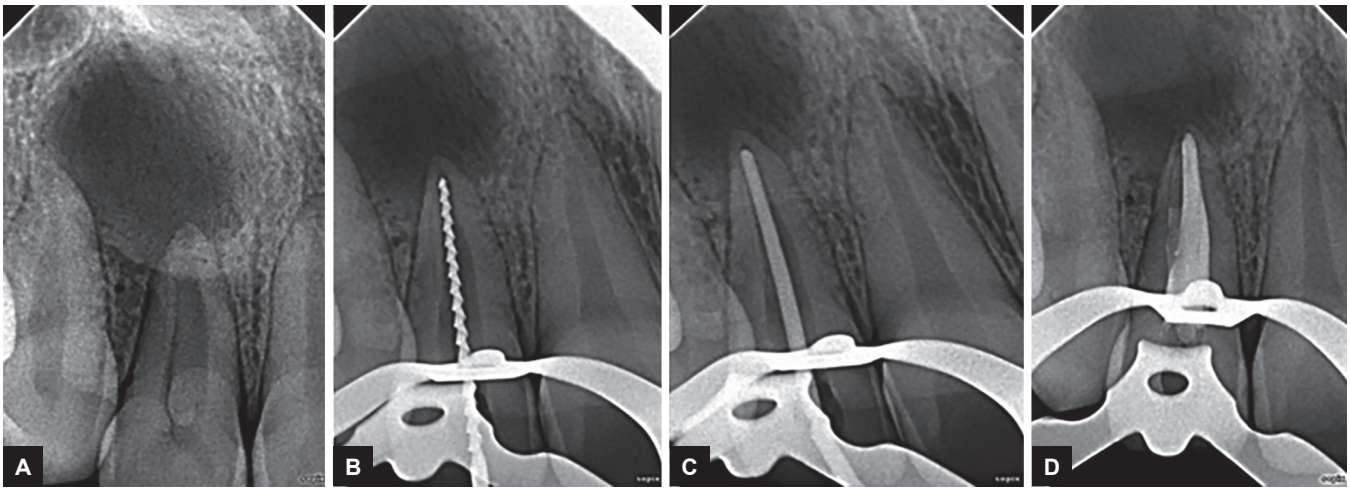


Figs 3A and B: (A and B) Preoperative radiograph showing parapulpal line and periapical radiolucency; and (C and D) three-dimensional CBCT images showing the alveolar defect

and calcium hydroxide powder mixed in saline into paste form was applied using a lentulospiral into canal space as an intracanal medicament for 1 week.

Patient was reviewed after 1 week. Patient was asymptomatic and the sinus had healed. Tooth was irrigated, dried with paper points and obturated, and down-packed and backfilled with thermoplasticized gutta-percha (Elements Obturation System, Sybron Endo, Orange, CA) and AH Plus sealer (Dentsply Maillefer, Ballaigues, Switzerland) (Figs 4C and D). The access cavity was sealed with glass ionomer cement (Fuji II; GC Corporation, Tokyo, Japan) (Fig. 5). The patient was reviewed after 1 week postoperatively and periodontal flap surgery was performed.

A full thickness mucoperiosteal flap was elevated on the palatal aspect of the maxillary right lateral incisor extending from 11 to 14 (Figs 6 and 7). On reflection, an advanced circumferential bony defect, which surrounded the palatal and distal aspect of lateral incisor, was found. The PRG was isolated to its most apical extent (Fig. 8). Thorough scaling and root planing were performed over the groove to remove the bacteria that might have colonized there. The diseased granulation tissue was curetted out (with Gracey curette number 1, 2 and 5, 6; Hu-Friedy Manufacturing Co, Chicago, Illinois) to leave the soft tissue more conducive to regeneration. Following root planing, the groove was prepared with round bur and root conditioning was done with tetracy-



Figs 4A to D: Endodontic treatment: (A) RVG image of 12; (B) working length determination; (C) master cone; and (D) obturation

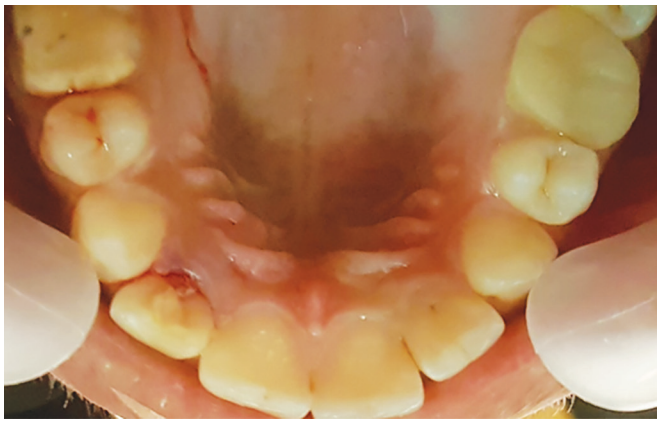


Fig. 5: Postendodontic treatment

Fig. 6: Crevicular incisions

Fig. 7: Elevation of full thickness mucoperiosteal flap

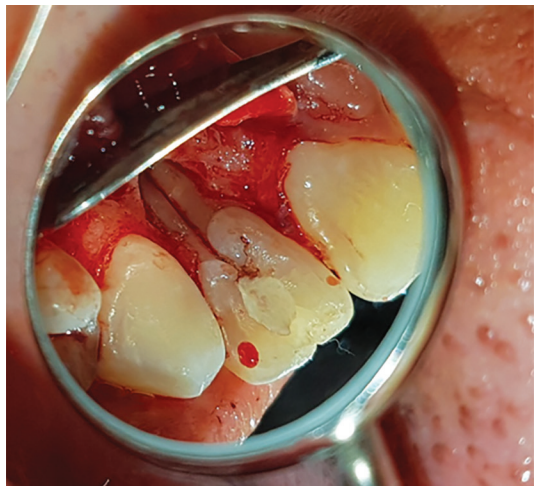


Fig. 8: Exposing the groove to its most apical extent

Fig. 9: Preparation of groove

Fig. 10: Root biomodification with tetracycline

cline for 3 minutes (Figs 9 and 10). The groove was then isolated, dried. White mineral trioxide aggregate (MTA; setting time – 15 minutes) (Dentsply Tulsa Dental, Tulsa, OK) was mixed according to the manufacturer's instructions and applied into the groove after proper isolation, under dental operating microscope (Global Surgical Corporation, USA) (Fig. 11). The material was allowed to set for about 15 minutes. During the setting phase, the tissues were kept hydrated using moist gauze piece.

A 12 mL sample of whole blood was drawn intravenously from the patient's right antecubital vein and centrifuged under 3,000 rpm for 10 minutes to obtain the platelet-rich fibrin (PRF) which was jelly-like in consistency. The localized bony cavity was filled with sterile

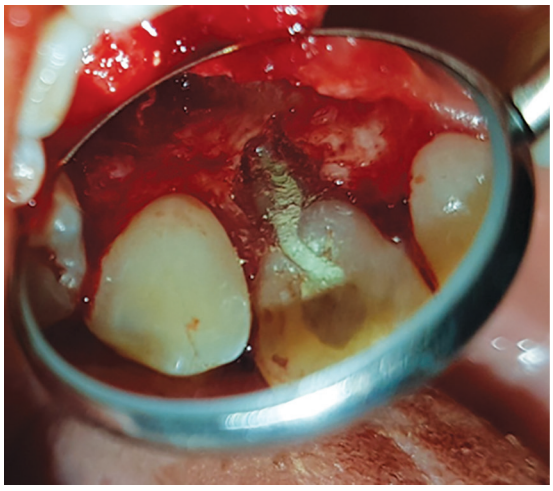


Fig. 11: Sealing groove with MTA

Fig. 12: Packing the osseous defect with bone graft mixed with PRF

Fig. 13: Adapting GTR membrane over bone graft material

Fig. 14: Flap repositioned with 4-0 sling sutures

bioresorbable demineralized bone matrix (DMBM) graft (Osseograft, Advanced Biotech Products Private Limited, India) mixed in PRF and placed into the deep bony defect and supported using a trimmed bioabsorbable guided tissue regeneration (GTR) collagen membrane (Colo Gide, Cologenesis Health care Pvt Ltd.) (Figs 12 and 13). The flap was readapted over the GTR membrane and immobilized using an interrupted suture and further the flap was stabilized with 4–0 nonabsorbable, nylon surgical monofilament (Ethilon, Ethicon Inc. Cornelia, Georgia) (Figs 14 and 15), and the wound site covered with non-eugenol periodontal dressing (Coe pak; GC Inc., Alsip, Illinois, USA). Patient was instructed on postsurgery precautions and maintenance protocol, which included rinsing with 0.12% solution of chlorhexidine twice a day for 3 weeks. The nonsteroidal anti-inflammatory drug Ibuprofen 400 mg was prescribed thrice daily for 3 days.

One week following surgery, the dressings and sutures were removed. Healing after surgery was uneventful. The patient was recalled at 3 weeks, 1, and 3 months postoperatively, during which clinical and

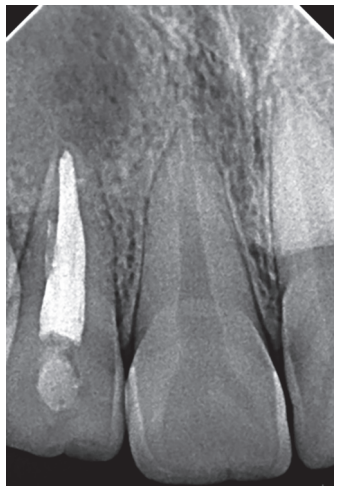


Fig. 15: Postoperative radiograph

radiographic evaluation of the endodontic and periodontal status was done. Three months review exhibited progressive healing, and radiograph evaluation revealed decreased radiolucency around the lateral incisor, suggesting attempts of bone fill of the previously existing osseous defects (Figs 16 and 17).

Fig. 16: Radiovisiographic view at 3-month follow-up

Fig. 17: Review at 3-month follow-up

DISCUSSION

Palatoradicular groove generally has a funnel-like shape, acting as a "plaque trap" which forms a niche where bacterial plaque and calculus accumulate, facilitating the development of a combined periodontal–endodontic lesion. While the epithelium is intact, the periodontium will probably remain healthy. Once the attachment of the junctional epithelium has been ruptured, however, an infrabony periodontal pocket will develop along the entire extension of the groove. Friedman and Goultschin[20] have suggested that pulpal necrosis followed by apical periodontitis is often the manifestation of PRG.

Among the 3,168 extracted maxillary lateral and central incisors investigated by Kogon,[2] 4.6% possessed a PRG. Approximately half of all grooves terminated at the root, and 58% extended more than 5 mm from the cementoenamel junction. Fifty-four percent of the PRGs in Kogon's study[2] were described as shallow depressions, 42% as deep depressions, and 4% as closed tubes.

Scanning electron microscopic study by Gao et al[8] on teeth with PRGs revealed that the groove is deepest cervically than apically.

The prognosis of teeth with radicular grooves depends on the severity of the periodontal lesion, accessibility of the defect, and the type of groove (shallow or deep, short or long), and the treatment strategy should also be modified based on these factors.[21]

Suggested treatment modalities include curettage of the affected tissues, elimination of the groove by grinding and/or sealing with a variety of filling materials, and surgical procedures. Garrido et al[22] have attempted a combined treatment approach, involving both endodontic therapy and intentional replantation after restoration with a self-etching flowable composite.

The rationale behind the selected treatment plan was the following:

- Removal or saucerization of the radicular portion of the groove to eliminate bacterial plaque and calculus and to prevent bacterial recolonization;
- Regeneration of periodontal attachment and bone and consequently improvement of the clinical conditions (reduction in pocket depth);
- Cleaning and sealing of the coronal portion of the groove to prevent bacterial recolonization.

Wei et al[23] treated the tooth with PRG by conventional endodontic therapy in combination with periodontal treatment including accessory root resection, odontoplasty, and bone grafting.

The sealing of groove was done after endodontic therapy to remove the nidus of infection in the canal. A lower concentration of 2.5% NaOCl was used as an irrigating solution and not as a working solution since there was a communication between the root canal and the periodontium.

When the groove is more advanced with associated extensive periodontal destruction, the treatment of the teeth is complex. Successful treatment of this particular type of PRG depends on the ability to eradicate inflammatory irritants by eliminating the groove and encouraging the patient to maintain good oral hygiene.

Chemical root biomodification was done with tetracycline following groove preparation, to enhance new attachment.[24] It exposes dentin collagen and cementum-bound proteins and has been found to elute retained toxins from the altered root surfaces. Such treatment enlarges dentinal tubules into which healing connective tissue can enter.[25-27]

The groove was sealed under dental operating microscope as it provides homogeneous illumination and magnification for detailed view and precise sealing of the defect.

Bonson et al[28] found that clinically derived human gingival and periodontal ligament fibroblasts survived

and proliferated in direct contact with MTA particles. The above studies are also supported by Balto,[29] who found that human periodontal ligament fibroblasts attach to MTA within 4 hours and then spread out over the surface during the subsequent 20 hours. The hydrophilic nature of the particles from MTA powder allows its use even in the presence of moisture.[30] Hence, MTA was used to seal the groove.

In Choukroun et al's[31] PRF, blood is collected without any biochemical modification (anticoagulant) and immediately centrifuged. Platelet-rich fibrin allows release of growth factors at a sustained rate over a longer period, thereby directing the organization of wound, optimizing wound healing, and thus contributing to regeneration of periodontal defects.[32]

The principles of GTR and mechanical barriers have been used to halt epithelium downgrowth along the root surface, allowing periodontal ligament, cementum, and bone to regenerate.[33,34] 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 to GTR procedures. McClain and Schallhorn[35] showed that attachment levels are maintained more predictably in sites treated with a combined graft/GTR therapy.

Demineralized freeze-dried bone allograft was chosen to fill the osseous defect because of its osteoconductive nature, and its ability to be converted into bone more rapidly.[36] Bioresorbable demineralized bone material is the protein component of bone and is widely used in various clinical conditions, such as periodontal defects and oral and maxillofacial bone defect. Periodontal defects grafted with DMBM allograft showed histological evidence of regeneration of new bone and periodontium.

CONCLUSION

In the present case, there was an option to extract the tooth. Although the palatal surgical approach is difficult to access, saving the tooth is the more conservative treatment plan, considering the age, the tooth being in the esthetic zone, and the papillary reconstruction would have been difficult after extraction and other prosthetic rehabilitation.

In this respect, the perio-endo lesion precipitated and complicated by the presence of a deep PRG was treated using a collaborative endodontic–periodontic treatment approach. The periodontal ligament attachment and periradicular healing were appreciated both clinically and radiographically at the 3-month follow-up. Long-term follow-up of the longitudinal stability of clinical and radiographic parameters is, however, required.

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