Case Report

Management of a maxillary lateral incisor with a type III palatogingival groove and 2 roots

A case report

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ABSTRACT

Background. The palatogingival groove is a developmental anomaly that originates in the central fossa and extends along the root surface, often resulting in periodontal, endodontic, or combined endodontic and periodontal involvement. The authors present a case of a type III palatogingival groove associated with a periodontal defect and a sinus tract managed successfully through surgical and regenerative treatment.

Case Description. A woman sought treatment at Clínica Dental ZOE in Zaragoza, Spain, with the chief symptoms of pain and swelling associated with tooth no. 7. Clinical and radiographic findings supported the diagnosis of type III palatogingival groove in the presence of a normal pulp. The additional root was resected, the periradicular lesion was curetted, and guided bone regeneration procedures were carried out. Long-term recall visits through 3 years confirmed successful retention of the tooth and periodontal regeneration in the absence of pathosis.

Practical Implications. The authors describe an unusual clinical manifestation and emphasize the role of accurate diagnosis leading to avoidance of unnecessary endodontic treatment, providing a reference for similar clinical situations. Considering the broad spectrum of manifestations of palatogingival grooves, a case-by-case multidisciplinary approach to management is recommended.

Key Words. Guided tissue regeneration; periodontal; periodontal diseases; tooth abnormalities; type III palatogingival groove.

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The maxillary lateral incisor can exhibit anatomic variations due to the embryologic challenge of its position between the dental germs of the central incisor and canine. The palatogingival groove is an anatomic malformation that typically originates in the central fossa, extends along the root with variable length and depth, and may affect both the periodontium and the dental pulp.[1-14] First described by Black[15] in 1908 as a "radicular groove," in 1958 Oehlers[16] reported the radicular invagination of a maxillary lateral incisor in an Asian woman. Later, in 1968, Lee and colleagues[17] introduced the term palatogingival groove to describe a groove located on the palatal aspect of the lateral incisor. Over time, several terms have been used to refer to this groove, including distolingual groove, coronoradicular groove, lingual radicular

groove, developmental vertical radicular groove, cinguloradicular groove, developmental radicular anomaly, interruption groove, palatal radicular groove, and palatoradicular groove.[3-5,9,13,14]

The prevalence of this variation has been associated with ethnicity and was reported as 2.8% by Everette and colleagues[18] and 2.3% by Withers and colleagues.[19] It occurs in 4.4% of maxillary lateral incisors and 0.28% of central incisors.[1,2,4-10,12,13]

Gu[20] classified palatogingival grooves according to their apical position and associated root canal morphology. Type I is characterized by a short, asymptomatic groove that does not extend beyond the coronal one-third of the root. A type II palatogingival groove is a long, shallow groove extending past the coronal one-third, typically associated with a C-shaped canal. Type III refers to a long, deep groove extending beyond the coronal one-third, often accompanied by a complex root canal system and additional roots.[20] This type may manifest with symptoms arising from endo-periodontal involvement, as in our case,[1-5,7-10,14] and is regarded as the most complex to manage conservatively; it is relatively rare.[21]

The etiology of this anomaly remains uncertain, with the following 4 hypotheses proposed: (1) a developmental anomaly involving Hertwig epithelial root sheath, (2) a variant of *dens invaginatus*, (3) genetic factors, (4) or an attempt at forming an additional root.[1,3-6,8-10] The prognosis for teeth affected by means of a palatogingival groove depends on their location, morphology, accessibility, and the extent of associated periodontal involvement. Early diagnosis supported by means of thorough clinical and radiographic examinations is crucial for improving treatment outcomes.[1,10,13,14]

We present the conservative management of a type III palatogingival groove in the primary setting, prepared in accordance with CAse REport guidelines.[22]

CASE PRESENTATION

A 24-year-old woman with an unremarkable medical history was referred to the Clínica Dental ZOE in Zaragoza, Spain, for endodontic treatment of the maxillary right lateral incisor (tooth no. 7) due to an actively draining vestibular sinus tract (Figure 1A).

On clinical examination, the tooth was unrestored and a stained palatal groove was evident (Figure 1B). The groove was associated with an isolated, narrow probing defect measuring 8 mm in depth, and periodontal probing elsewhere was within normal limits. Tooth no. 7 was tender to percussion in both vertical and lateral directions, and palpation of the buccal soft tissue elicited pain. Pulp sensibility testing with cold stimulus (ROEKO Endo-Frost; Coltene Whaledent) produced a response. Radiographic assessment, including periapical radiographs and cone-beam computed tomography (CBCT) (Figure 2), revealed a type III palatogingival groove with an additional root and an associated mesial periradicular defect. These findings guided the treatment plan, and informed consent was obtained from the patient.

Given the absence of pulpal involvement, an external surgical approach was selected to reestablish periodontal health while maintaining pulpal vitality. Full-thickness vestibular and palatal flaps were elevated via intrasulcular incisions, the additional root was resected, and the bony lesion was curetted (Figures 3A and 3B). Guided tissue regeneration (GTR) was then carried out using Emdogain (Straumann) enamel matrix derivative (EMD), a Lyoplant (Aesculap AG) resorbable collagen membrane secured with fixation pins, and a Bio-Oss (Geistlich Pharma AG) small-particle bone graft (Figures 3C through 3E). Suturing was performed using Seralon (Serag-Wiessner GmbH & Co KG) 5-0 monofilament silk. A final periapical radiograph confirmed correct placement of the grafting materials and adequate resection of the additional root (Figure 3F).

Suture removal at 2 weeks revealed favorable soft-tissue healing (Figure 4A). At 6 months, results of probing showed improved attachment levels in the affected periodontal pocket (Figure 4B). At 12 months, clinical and radiographic examinations confirmed maintained pulp vitality and substantial bone regeneration mesial to tooth no. 7 (Figure 4C). The patient remained asymptomatic 3 years postsurgery, with continued clinical and radiographic improvement, near-complete regeneration of the interdental papilla between tooth no. 7 and tooth no. 8 (Figure 4D), and a stable alveolar bone crest, as seen with imaging using CBCT (Figure 4E).

ABBREVIATION KEY

CBCT: Cone-beam computed tomography.
EMD: Enamel matrix derivative.
GTR: Guided tissue regeneration.

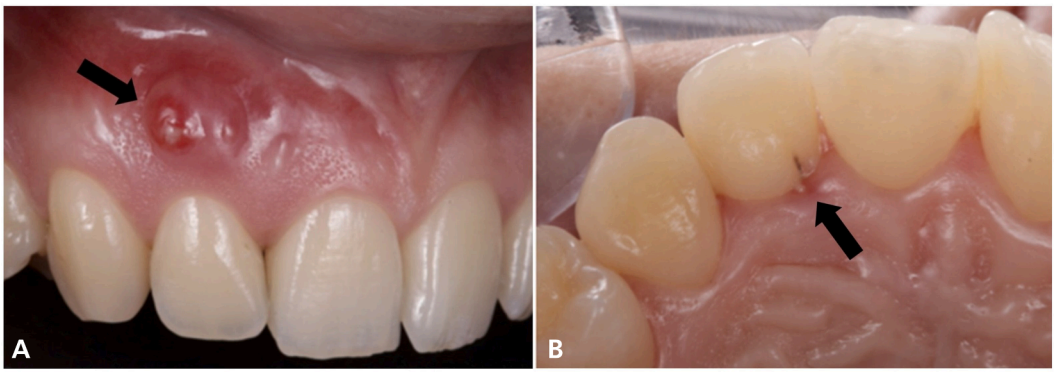

Figure 1. Intraoral preoperative clinical photographs. **A.** Buccal sulcus in relation to tooth no. 7 reveals a sinus tract (black arrow). **B.** Palatal groove on tooth no. 7.

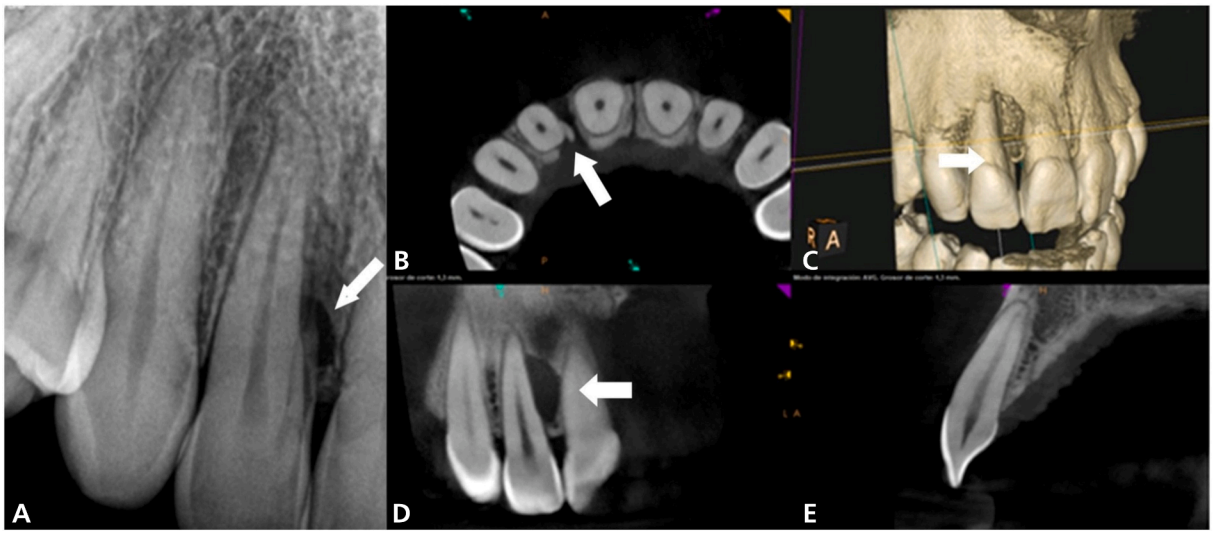

Figure 2. Preoperative imaging. **A.** Periapical radiograph of tooth no. 7 reveals the secondary root and an associated periradicular radiolucency (white arrow). Cone-beam computed tomographic slices. **B.** Axial view reveals second root (white arrow). **C.** 3-Dimensional reconstruction. **D.** Coronal view reveals the associated radiolucency suggestive of a periodontal defect (white arrow). **E.** Sagittal view.

DISCUSSION

Palatogingival grooves can give rise to primary periodontal lesions that may secondarily involve the dental pulp, resulting in combined endoperiodontal lesions. This occurs because of anatomic communications between the pulpal and periodontal tissues, including the groove itself. Microorganisms may migrate along this pathway and potentially lead to pulpal necrosis. In our case, as in the report by Corbella and colleagues, generalized periodontitis was excluded, as were other localized endodontic causes such as periapical infections draining through the groove, vertical root fractures, and inadequate restorations.[1,3,9,14] This reinforces the importance of establishing an accurate diagnosis.

Our case had clinical and radiographic success via a regenerative approach for intraosseous lesions associated with a type III palatogingival groove. Periodontal regenerative therapy resolved the defect, preserved pulpal vitality, and prevented infection recurrence, consistent with Corbella and colleagues'[23] findings. Patients may have intermittent or acute pain, tooth mobility, purulent discharge, sinus tract formation, or gingival inflammation, although some remain silent. Typically, there is no history of caries, trauma, or discoloration. Pulp sensibility testing may vary; for example, negative in advanced cases or positive despite a sinus tract, as in our case.[14] Conventional radiographs may reveal coronal and apical bone loss as well as radiolucent lines along the root; however, their 2-dimensional limitation hinders precise evaluation of subgingival and alveolar

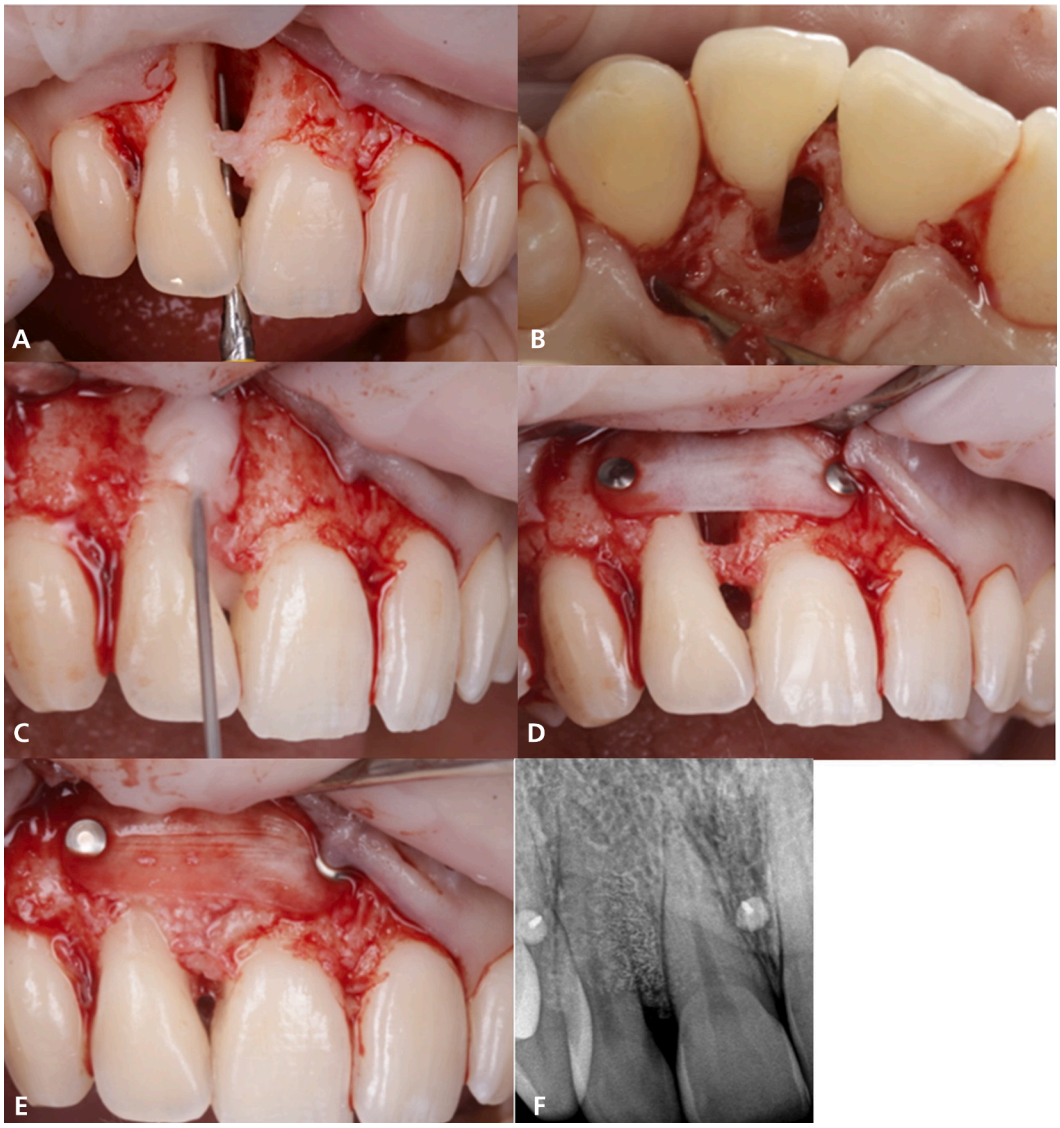

Figure 3. Surgical management. **A.** Secondary root resection. **B.** Infrabony defect from palatal view. **C.** Placement of enamel matrix derivative (Emdogain, Straumann). **D.** Stabilization of resorbable collagen membrane (Lyoplant, Aesculap) using fixation pins. **E.** Small-particle Bio-Oss (Geistlich Pharma AG) bone graft in situ. **F.** Postoperative periapical radiograph indicates correct placement of grafting.

bone involvement. CBCT provides high-resolution 3-dimensional imaging, allowing detailed assessment of internal and external tooth morphology, groove extension, and potential additional roots. Axial planes are particularly effective for evaluating groove depth, whereas microcomputed tomography offers even greater detail but remains clinically impossible due to its high radiation dose, restricting its use to ex vivo assessments.[1,4,7,8,10,12,16]

The management of palatogingival grooves warrants further discussion. Historically, teeth with a palatogingival groove and associated sinus tracts were often extracted due to their purported poor prognosis. However, several researchers have reported successful outcomes with conservative treatment, even in the presence of complex endodontic and periodontal conditions.[21]

Treatment objectives include microbial elimination, effective sealing of the groove, and regeneration of the periodontal space. The choice of approach depends on defect severity, groove extension, and the presence of additional roots. Pulpal status guides intervention; infected teeth require prior root canal treatment, and teeth with positive sensibility test results should be monitored. Potential treatment options include curettage, groove saucerization, sealing up to the cementoenamel junction, endodontic and periodontal procedures (performed separately or in combination), and surgical techniques such as GTR, guided bone regeneration, or intentional

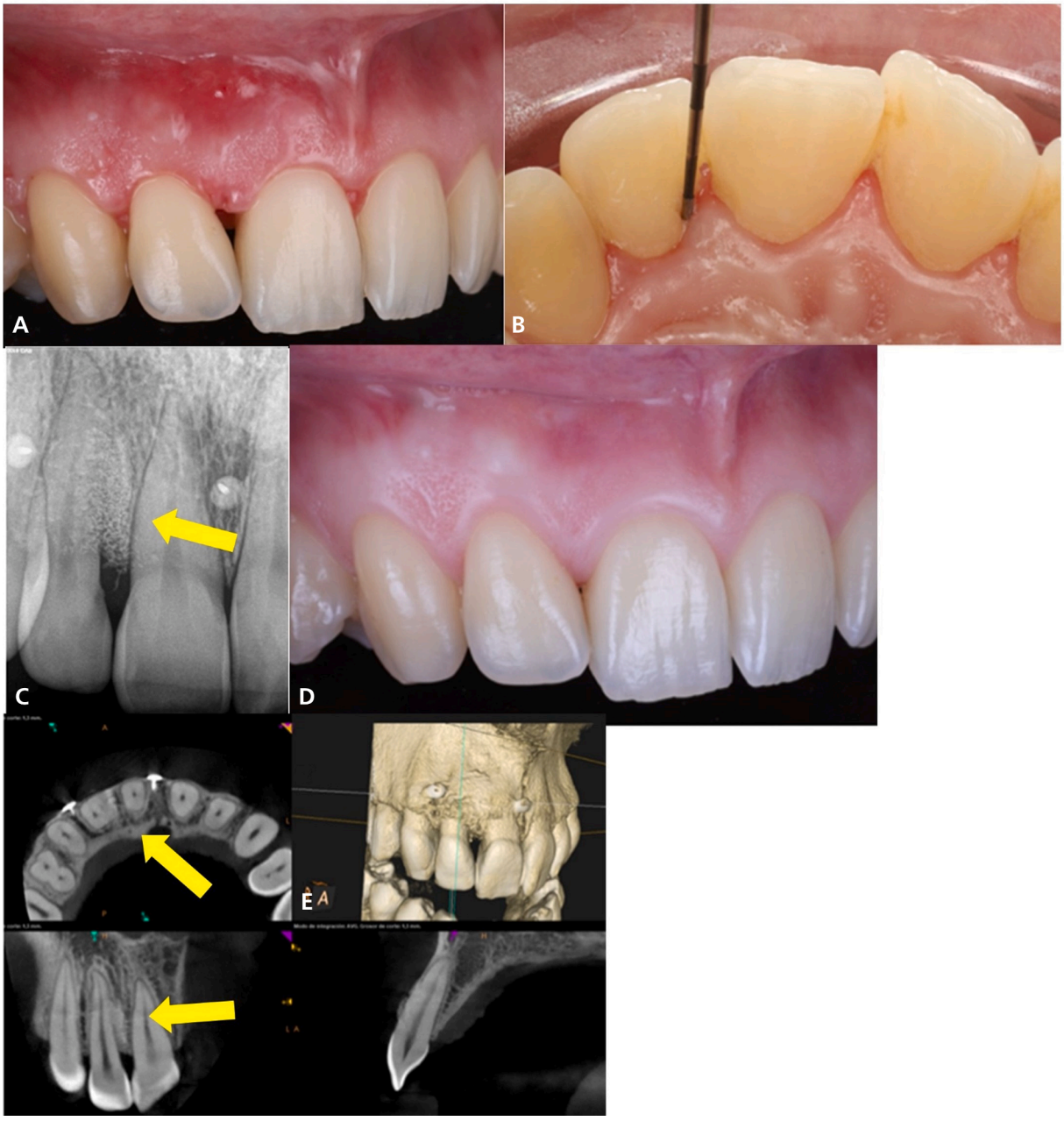

Figure 4. Recall visits. **A.** Intraoral clinical photograph of buccal sulcus in relation to the right maxillary incisors indicates normal soft tissues 2 weeks after surgery. **B.** Periodontal probing of the palatal aspect of tooth no. 7 revealed no pockets extending more than 3 mm at the 6-month recall examination. **C.** Postoperative periapical radiograph indicating absence of periradicular radiolucency at 1-year recall visit (yellow arrow). **D.** Intraoral clinical photograph indicates interdental papilla regeneration in relation to tooth no. 7 at the 3-year recall visit. **E.** Cone-beam computed tomographic slices confirm absence of periradicular radiolucency at the 3-year recall visit (yellow arrows).

reimplantation.[1,3,13,14,20] For type I and type II palatogingival grooves,[20] odontoplasty followed by smoothing and sealing of the groove, in combination with appropriate periodontal therapy, is recommended. Materials previously used include amalgam, glass ionomer cement, composite resin, and calcium silicate–based cements such as mineral trioxide aggregate and Biodentine (Septodont).[1-3,13] In our case, the groove was not sealed because there was no evident communication with the periodontium. In fact, results of imaging with CBCT failed to show a canal in the additional root.

In cases with substantial periodontal involvement, surgical options include granulation tissue removal via flap, crestal bone saucerization with or without GTR, or additional root removal with intentional reimplantation, as described by Tan and colleagues.[7] In our case, a full-thickness flap

provided complete access for lesion debridement and additional root resection.[1,3,7,14] Periodontal regeneration may involve the use of membranes, bone grafts, platelet-rich plasma, and EMD, which promote fibroblast and epithelial cell proliferation, adhesion, migration, and bone remodeling, as Cortellini and Tonetti[13] reported previously.[1,3,14] Both our case and that reported by Corbella and colleagues[23] established that regenerative periodontal therapy with EMD can resolve palatogingival groove–associated defects while preserving pulp vitality. A case-by-case approach is essential, given the wide spectrum of palatogingival groove presentations. Nevertheless, early and accurate diagnosis substantially improves prognosis.[14]

CONCLUSIONS

Although the prevalence of type III palatogingival grooves is considered low, accurate identification and management are critical for tooth retention. Our clinical case established the efficacy of a regenerative therapeutic approach resulting in complete resolution of the associated periodontal defect, preservation of pulpal vitality, and prevention of infection recurrence. ■

DISCLOSURE

None of the authors reported any disclosures.

SUPPLEMENTAL DATA

Supplemental data related to this article can be found at: 10.1016/j.adaj.2026.02.008.

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1. Ansari I, Miglani S, Yadav V, Hasan S. Management of palatogingival groove in maxillary lateral incisor: a report of a rare case with a brief review of literature. *Cureus*. 2023;15(10):e46479. doi:10.7759/cureus.46479

2. Tan X-L, Chen X, Fu Y-J, Ye L, Zhang L, Huang D-M. Diverse microbiota in palatal radicular groove analyzed by Illumina sequencing: four case reports. *World J Clin Cases*. 2021;9(23):6846-6857.

3. Rijal AH, Dhami B, Ghimire P. Combined periodontal and endodontic management of palatal radicular groove with platelet-rich fibrin and Biodentine®. *Case Rep Dent*. 2022;2022:6461654. doi:10.1155/2022/6461654

4. Alkahtany SM, Alrwais F, Altamimi A, Bukhary SM, Mirdad A. The incidence of radicular groove on maxillary lateral incisors of Saudi population: CBCT evaluation. *BMC Oral Health*. 2022;22(1):583. doi:10.1186/s12903-022-02616-1

5. Gaudex Y, Gandillot V, Fontanille I, Bouchard P, Kerner S, Carra MC. Palatal groove associated with periodontal lesions: a systematic review illustrated by a decisional tree for management. *BMC Oral Health*. 2024;24(1):1037. doi:10.1186/s12903-024-04771-z

6. Kishan KV, Hegde V, Ponnappa KC, Girish TN, Ponappa MC. Management of palato radicular groove in a maxillary lateral incisor. *J Nat Sci Biol Med*. 2014;5(1):178-181.

7. Tan D, Li S-T, Feng H, Wang Z-C, Wen C, Nie M-H. Intentional replantation combined root resection therapy for the treatment of type III radicular groove with two roots: a case report. *World J Clin Cases*. 2022;10(20):6991-6998.

8. Ling D-H, Shi W-P, Wang Y-H, Lai D-P, Zhang Y-Z. Management of the palato-radicular groove with a periodontal regenerative procedure and prosthodontic treatment: a case report. *World J Clin Cases*. 2022;10(17):5732-5740.

9. Miao H, Chen M, Otgonbayar T, et al. Papillary reconstruction and guided tissue regeneration for combined periodontal-endodontic lesions caused by palatogingival groove and additional root: a case report. *Clin Case Rep*. 2015;3(12):1042-1049.

10. Giner-Lluesma T, Micó-Muñoz P, Prada I, et al. Role of cone-beam computed tomography (CBCT) in diagnosis and treatment planning of two-rooted maxillary lateral incisor with palatogingival groove: case report. *J Clin Exp Dent*. 2020;12:e704-e707. doi:10.4317/jced.57092

11. Hasan A, Ali Khan J. Combined endodontic and surgical management of twin rooted maxillary lateral incisor with a palatogingival groove. *Iran Endod J*. 2018;13(3):413-419.

12. Mahadevan M, Paulaian B, Ravisankar SM, Arvind Kumar A, Nagaraj NJ. Endodontic management of maxillary central incisor with two roots, and lateral incisor with a C-shaped canal; a case report. *Iran Endod J*. 2023;18(2):104-109.

13. Cortellini P, Tonetti MS. Clinical concepts for regenerative therapy in intrabony defects. *Periodontol 2000*. 2015;68(1):282-307.

14. Wang H-L, Boyapati L. "PASS" principles for predictable bone regeneration. *Implant Dent*. 2006;15(1):8-17.

15. Black GV. *Operative Dentistry: Pathology of the Hard Tissues of Teeth*. Medico-Dental Publishing; 1908.

16. Oehlers FA. The radicular variety of *dens invaginatus*. *Oral Surg Oral Med Oral Pathol*. 1958;11(11):1251-1260. doi:10.1016/0030-4220(58)90278-0

17. Lee KW, Lee EC, Poon KY. Palato-gingival grooves in maxillary incisors: a possible predisposing factor to localised periodontal disease. *Br Dent J*. 1968;124(1):14-18.

18. Everett FG, Kramer GM. The disto-lingual groove in the maxillary lateral incisor: a periodontal hazard. *J Periodontol*. 1972;43(6):352-361.

19. Withers JA, Brunsvold MA, Killoy WJ, Rahe AJ. The relationship of palato-gingival grooves to localized periodontal disease. *J Periodontol*. 1981;52(1):41-44.

20. Gu YC. A micro-computed tomographic analysis of maxillary lateral incisors with radicular grooves. *J Endod*. 2011;37(6):789-792.

21. Tan X, Zhang L, Zhou W, et al. Palatal radicular groove morphology of the maxillary incisors: a case series report. *J Endod*. 2017;43(5):827-833.

22. Riley DS, Barber MS, Kienle GS, et al. CARE guidelines for case reports: explanation and elaboration document. *J Clin Epidemiol*. 2017;89:218-235.

23. Corbella S, Alberti A, Zotti B, Francetti L. Periodontal regenerative treatment of intrabony defects associated with palatal grooves: a report of two cases. *Case Rep Dent*. 2019:8093192. doi:10.1155/2019/8093192