

## Interdisciplinary Management of Palato-Radicular Groove: A Case Series

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**ABSTRACT:** A Palato-radicular groove is a malformed anatomic developmental groove which makes the involved tooth susceptible to a severe periodontal defect. When the condition is complicated by pulpal necrosis, affected teeth often present a conundrum in terms of diagnosis and treatment planning. The hidden tract can harbor plaque and bacteria, resulting in the periodontal breakdown with or without pulpal pathosis. This can give rise to periodontal destruction, combined endodontic-periodontal lesions, or either endodontic or periodontal lesions. This article reports a series of 3 representative cases of interdisciplinary management of a Palato-radicular groove in maxillary lateral and central incisors. The development, pathology and various treatment modalities in cases involving a combined periodontal-endodontic lesion with a palate-gingival groove are discussed.

**KEY-WORDS:** Palato-radicular groove, Periodontal-endodontic lesion, Maxillary incisors

**Key Messages:** Diagnosis and treatment of Palato-radicular groove often requires an interdisciplinary approach and the treatment depends on the complexity of the groove.

### I. INTRODUCTION:

Palato-radicular groove was first described as a radicular groove by Black in 1908, is a developmental anomaly usually located on the root surface of the palatal aspect of a maxillary incisor.<sup>1-3</sup> In 1958, Oehlers first reported an invagination on the radicular aspect of a maxillary lateral incisor in a Chinese female.<sup>4</sup> In 1968, Lee et al. proposed the term Palato-radicular groove (PGG) to describe a groove on palatal aspect of lateral incisor teeth.<sup>5</sup>

These grooves are rare, with a prevalence of approximately 2.8%–8.5%.<sup>6</sup> Withers et al. reported a prevalence of 2.3% in maxillary incisors (4.4% of maxillary laterals and 0.28% of maxillary centrals)<sup>7</sup>, and Everett and Kramer reported their presence in 2.8% of lateral incisors. Kogon observed 3168 extracted maxillary central and lateral incisors and reported that 4.6% of maxillary incisors presented with these developmental grooves (3.4% of maxillary centrals and 5.6% of maxillary lateral incisors).<sup>8</sup> They also found that 54% of palate-gingival grooves terminated on the root, with 43% of these extending up to middle third (less than 5 mm) and 47% extending up to the apical third (approximately 6–10 mm of the root length). These variations in prevalence rates are possibly caused by different diagnostic criteria or examination methodologies (e.g., survey of extracted teeth vs. clinical examination) or by differences in races and ethnicity, which would suggest a genetic relationship (e.g., relatively high prevalence in Sino Americans and low prevalence in Sub-Saharan Africans and Sahul-Pacific people).<sup>9</sup>

The radicular lingual groove or the Palato-radicular groove usually begins as a tract in the central fossa of palatal surfaces of maxillary incisors, crossing over the cingulum to extend apically for varying distances on the root surfaces and varying depths in relation to the root canal. Several etiologies have been suggested for its development: (a) infolding of the enamel organ and Hertwig's epithelial root sheath (b) variation of Dens in dente 2, (b) an incomplete attempt towards an additional root formation on the affected

tooth and recently, (c) alteration of genetic mechanisms and racial possibility has been suggested. It is a concealed funnel shaped defect prone for accumulation of plaque or calculus.

If the defect remains undiagnosed, it can precipitate a series of periodontal consequences like attachment loss, periodontal pocket formation, and progressive bone loss. Additionally, bacterial invasion from these catchment areas can lead to an endodontic involvement and the development of combined endodontic – periodontal lesions.

## **II. CASE REPORT 1**

A 44-year-old female patient reported to the Department of Periodontology & Implantology, complaining chiefly of loose teeth in the front region of the upper jaw. Dental history did not reveal any incidence of trauma and the patient did not report any earlier episodes of severe pain or swelling with respect to the concerned tooth. On periodontal examination tooth number 21 presented with a periodontal pocket depth of 9mm on the mesial aspect of palatal surface, an associated marginal and papillary gingival inflammation was observed, recession was present and mild pathological migration was observed. It overlay a groove that in all probability although covered seemed to continue as an indentation onto the lingual surface. Tenderness on percussion was mild with presence of grade II mobility. Overall hygiene status of the patient was satisfactory. The crown was intact without any carious lesion or fracture line. Electric pulp testing elicited no response indicating the presence of a non-vital pulp. Pulp most likely necrosed due to the development of a periodontal pocket adjacent to the groove.

Intraoral peri-apical radiograph of the tooth showed lateral radiolucency on both mesial and distal aspect indicative of an intrabony defect. Based on these findings, it was concluded that tooth 21 presented with a palate-radicular groove which was responsible for the development of localized periodontitis and necrotic pulp.

A combined endodontic - periodontal management was planned for this tooth. In phase one therapy, oral prophylaxis was performed. Stabilization of the tooth was done with semi-rigid splint (Ribond). In the endodontic phase of therapy, the tooth was isolated under rubber dam, and an access cavity was prepared. Working length was determined using electronic apex locator (Root ZX, J. Morita Mfg. Corporation, Kyoto, Japan) and intraoral peri-apical radiographs. The apical patency and cleaning and shaping was performed with stainless steel K-files (Mani, Japan) and rotary Ni-Ti files (Protaper, Dentsply-Maillefer, Switzerland). Intermittent irrigation with 5.2% Sodium Hypochlorite (Novo Dental Product, India) was performed after recapitulation with a K-file. After complete cleaning and shaping, a master cone was selected and obturation was done using an AH Plus sealer (DentsplyDeTrey GmbH, Konstanz, Germany). The tooth received a final post obturation restoration with composite resin. (Swisstech, Coltene).

In second/periodontal phase of therapy, both intraoral and extraoral tissues on and around the surgical site were painted with Betadine. 2% lignocaine with 1:100,000 adrenaline was administered for anesthesia. As the patient presented with spacing between 12, 11 and 21 a modified papilla preservation full thickness periosteal flap was raised. On raising the flap, intrabony defect was seen extending apically along the palato-radicular groove. Thorough debridement around the groove was performed by meticulous scaling and root planing. Granulation tissue was debrided using Gracey curettes. (Hu-Friedy Manufacturing Co., Chicago, IL). The groove was shaped with high-speed round diamond under continuous air-water spray and flushed smoothly with the adjoining surface. Since the depth of the groove was minimal, no restorative material was placed.

Regenerative therapy was carried out with bone graft (OsseoGraft DMBM, Advanced Biotech products Ltd, Chennai, India) and a guided tissue membrane (Healguide, Advanced Biotech products Ltd, Chennai, India) was adapted following which the flap was re-approximated with vertical mattress sutures. Analgesics and antibiotics were prescribed, and the patient was given oral hygiene instructions which included no brushing in the treated area for a period of 1 week and a regular chlorhexidine (0.12%) mouth rinse for 2 weeks. The patient was recalled for suture removal after 1 week, and subsequent follow ups at 1 month, 3 and 6 monthly interval. At 3 months, the gingiva appeared healthy and probing depth reduced to 3 mm. (Fig. 1).



a – pre-operative IOPA, b – pocket of 7 mm depth, c – incisions, d – full thickness flap was raised, e – Thorough debridement and groove was saucerized to receive Glass Ionomer Cement, f – suturing, g – 3 months post-operative, h – 1 year follow-up IOPA

### III. CASE REPORT 2

A 42-year-old female patient reported to the Department of Conservative Dentistry and Endodontics, with a chief complaint of intermittent dull pain and discomfort in right front region of the upper jaw. Clinical examination depicted a deep periodontal pocket of 7 mm depth exactly in the middle of palatal aspect of 12. . The patient did not have any caries and history of trauma. The patient presented with pain on percussion on the affected tooth. A developmental groove was seen arising just above the cingulum and running apically on the root surface. On radiographic examination, with 12 generalized PDL space widening. This extensive amount of probing depth and presence of the developmental groove in the vicinity of the pocket, classically in the palatal aspect gave a suspicion of Palato-radicular groove, which on careful examination was discovered on the right lateral incisor.

Phase one therapy followed by an endodontic treatment was planned and root canal treatment was done followed by which periodontal management was undertaken. Complete extraoral and intraoral mouth disinfection was done with betadine, local anesthesia was administered and anesthesia was achieved. A Kirkland flap was raised. The defect was curetted and cleaned and a clear groove was visible after flap reflection; the groove was then saucerized to receive Glass Ionomer Cement restoration (Glass Ionomer cement version2, Shofu, Japan). The defect was filled with Platelet Rich Fibrin and the flap was re-approximated and sutures were placed followed by a periodontal pack. The patient was asymptomatic postoperatively and sutures were removed after a period of 7 days. The patient was recalled after 3 months, and a reduction of the pocket depth to 3 mm was noted (Fig. 2).





a – pre-operative IOPA, b – pocket of 5 mm depth, c – incisions, d – full thickness flap was raised, e,f – Thorough debridement and groove was saucerized to receive Biodentin, g – suturing, h – 3 months post-operative, i – 1 year follow-up IOPA

#### IV. CASE REPORT 3

A 40-year-old female patient reported to the Department of Periodontology, with a chief complaint of increased spacing in front region of the upper jaw. On Periodontal examination, a periodontal pocket of 7 mm depth on the mesial aspect of palatal surface with 21 was observed. A developmental groove was visualized arising mesially on the palatal aspect with 21, coronal at the cingulum and running apically. Pathological migration was seen in disto-labial direction with 21. The tooth did not respond positively to electric pulp testing suggesting non-vitality. On radiographic examination, horizontal bone loss was seen on both mesial and distal aspect of 21.

Phase one therapy followed by an endodontic treatment was planned and root canal treatment was done followed by which periodontal therapy was planned. A simplified papilla preservation flap was raised to uncover the full extent of the palato-radicular groove. Debridement and sauerization of the groove was done so as to receive Biodentine (Septodont, France). Biodentine was manipulated according to the manufacturer's recommendation and packed into the groove after haemostasis was achieved. The flap was approximated after the material reached an initial set after 9 minutes; followed by suturing. Postoperative instructions and antibiotic regimen was initiated and the patient was recalled after a period of 1 week for suture removal. After 3 months, the periodontal probing depth reduced to 2 mm (Fig. 3).



a – post-endodontic IOPA showed an intrabony defect, b – clinical picture overlay a groove, c – incisions, d – full thickness flap was raised, e – defect was seen extending along the groove, f – Thorough debridement and recontouring, g,h – bone graft and a guided tissue membrane was adapted, i – suturing, j – 3 months post-operative, k – crown prosthesis, l – 1 year follow-up

## V. DISCUSSION:

Combined endodontic-periodontal lesions are real clinical enigmas due to difficulty in making a differential diagnosis and deciding a prognosis. Extent and complexity of the groove were classified by Goon et al in 1991 as mild, moderate and complex. Mildly involved teeth reveal a gentle depression of the radicular dentin lined with cementum and terminates soon after crossing the cemento-enamel junction whereas moderate grooves continue some distance apically along the root surface in the form of a fissured defect. It is considered as a failed attempt to form another root. Complex radicular grooves are deeply invaginated defects which involve most of the root length. The complex groove arises from the complete invagination of the epithelial root sheath; it is considered as the mildest form of dens invaginatus. Although true dens invaginatus, is confined totally to the crown and enamel of the tooth. The radicular groove involves the external surface of both the crown and root.<sup>10</sup>

Kerezoudis et al.<sup>11</sup> recommended certain treatment options for management of a palatogingival groove which involved: (1) removal of granulation tissue and irritants surgically (2) Gingivectomy & apically positioned flap (3) Surgically exposing and flattening the groove by grinding, with or without guided tissue regeneration techniques (4) restoration of the groove with amalgam (5) Orthodontic extrusion. Although shallow grooves which are located entirely on the crown can be corrected by odontoplasty and curettage of granulation tissue, more complicated radicular grooves that are associated with severe periodontal breakdown and extensive periapical lesion need surgical intervention.<sup>12</sup>

In cases with mild palatogingival grooves with physiologic mobility and shallow grooves, odontoplasty in along with periodontal treatment, including gingivectomy or subgingival root planing, is the usual treatment method. The probable pathology caused by the groove space is expected to be eliminated by flushing the irregularities of the groove or sealing it with any of the filling materials. ‘Saucerization’ is one method for treating the mild form of PGG that involves grinding the groove to the level of the crestal bone with a rotary cutting and polishing instrument and flushing the root surface.<sup>13</sup>

For more complex cases, multiple methods have been suggested: granulation tissue removal through a flap, elimination of the defect at the level of the crestal bone using rotatory instruments (saucerization) with or without the guided tissue regeneration technique, intentional extraction of the tooth and subsequent reimplantation (intentional replantation), orthodontic extrusion, and extraction. In such cases with an extensive

groove, some authors have reported successful treatment outcomes with intentional replantation.<sup>14</sup>

Glass Ionomer cement has been widely used in the restoration of PGG because of its favorable characteristics for both the tooth surface and periodontal tissues. This material is resistant to water degradation at the tooth-cement interface, it shows good sealing ability as it bonds the tooth through chemical bonding, and has an antibacterial effect.<sup>15</sup> The fluoride released in GIC can interfere with the initial attachment of bacteria and inhibit their metabolism and growth.<sup>16</sup> It has also been reported that epithelial and connective tissue attachment occurred on the cement surface.<sup>17</sup>

Recently, calcium silicate-based cements have been developed and are widespread in clinical practice. In several case reports, Mineral Trioxide Aggregate has been used to restore the subgingival groove of a tooth. Although MTA has several favorable properties (excellent biocompatibility, sealing ability, and hydrophilic nature), difficulty in material handling and the possibility of wash-off, especially in cases of transgingival defect and a long setting time, make it difficult to use in PGG cases.<sup>18</sup> Because PGG is mostly distributed from the crown area to the root of the tooth, mechanical properties that can endure intraoral conditions and biocompatibility with subgingival conditions are the most important considerations. Some authors have reported a successful treatment outcome for PGG with Biodentine, describing advantages such as easy handling, a relatively short setting time of 9 to 12 minutes, improved mechanical properties, good biocompatibility, and regenerative potential.<sup>19,20,21</sup>

If the groove extends beyond the apical third of the root, surgical interventions are required to access the whole groove area and related defects. For regeneration of periodontal tissues, diverse barrier or graft materials (bone grafts, platelet-rich plasma, and enamel matrix derivative) have been used in such cases, with consideration of the size of the bone defect and the presence of palatal bone loss.

Attam et al. reported that a combination technique of bone graft and membrane rapidly and significantly reduced the pocket depth, when compared with cases treated by open flap debridement.<sup>22</sup> Anderegg et al. also reported 10 cases of successful treatment after 6 month follow-up using a polytetrafluoroethylene membrane.<sup>23</sup> Chang et al. stated that Platelet Rich Fibrin (PRF) promotes the expression of phosphorylated extracellular signal-regulated protein kinase (p-ERK) and stimulates the production of osteoprotegerin (OPG) which in turn causes increase in proliferation of osteoblasts.<sup>24</sup> Sharma et al. conducted a randomized controlled clinical trial for the treatment of 3-wall intrabony defects in chronic periodontitis patients with platelet rich fibrin and reported a statistically significant improvement in pocket depth reduction and bone fill in the test group than in controls.<sup>25</sup> Thorat et al. investigated the clinical and radiological efficiency of autologous PRF in the treatment of intrabony defects of chronic periodontitis patients and reported a greater reduction in pocket depth, increased gain in clinical attachment level and increased correction of intrabony defect especially at sites treated with PRF than those treated with open flap debridement alone.<sup>26</sup>

## VI. CONCLUSION:

In the present case series, despite a poor prognosis, the teeth were successfully managed by Interdisciplinary endodontic and periodontal therapies. There are many factors which should be considered in the treatment of a palate-radicular groove, exact diagnosis is very important to achieve long term success without complications.

## REFERENCES

- [1]. Attam K, Tiwary R, Talwar S, et al. Palatogingival groove: endodontic-periodontal management-case report. *J Endod.* 2010;36:1717–20.
- [2]. Kishan KV, Hegde V, Ponnappa KC, et al. Management of palato radicular groove in a maxillary lateral incisor. *J Nat Sci Biol Med.* 2014;5:178–81.
- [3]. Hungund S, Kumar M. Palato-radicular groove and localized periodontitis: a series of case reports. *J Contemp Dent Pract.* 2010;11:56–62.
- [4]. Oehlers FA. The radicular variety of dens invaginatus. *Oral Surg Oral Med Oral Pathol.* 1958;11:1251–1260.
- [5]. Lee KW, Lee EC, Poon KY. Palato-gingival grooves in maxillary incisors. A possible predisposing factor to localized periodontal disease. *Br Dent J.* 1968;124:1418.
- [6]. Everett FG, Kramer GM. The disto-lingual groove in the maxillary lateral incisor; a periodontal hazard. *J Periodontol.* 1972;43:352–61.
- [7]. Withers JA, Brunsvold MA, Killoy WJ, et al. The relationship of palato-gingival grooves to localized periodontal disease. *J Periodontol.* 1981;52:41–4.



- [8]. Kogon SL. The prevalence, location and conformation of palato-radicular grooves in maxillary incisors. *J Periodontol*. 1986;57:231–4.
- [9]. Castelo-Baz P, Ramos-Barbosa I, Martín-Biedma B, Dablanca-Blanco AB, Varela-Patiño P, Blanco-Carrión J. Combined endodontic-periodontal treatment of a palatogingival groove. *J Endod*. 2015;41:1918-1922.
- [10]. William W. Y. Goon, DDS, William M. Carpenter, DDS, MS, Nancy M. Brace, DDS, and Richard J. Ahlfeld, DDS Complex Facial Radicular Groove in a Maxillary Lateral Incisor. *J Endod*. 1992;17(5): 244-248.
- [11]. N. P. Kerezoudis, G. J. Siskos, and V. Tsatsas, “Bilateral buccal radicular groove in maxillary incisors: case report,” *International Endodontic Journal* 2003; 36(12):898–906.
- [12]. K. Attam, R. Tiwary, S. Talwar, and A. K. Lamba, “Palatogingival groove: endodontic-periodontal management—case report,” *Journal of Endodontics* 2010; 36(10):1717–20.
- [13]. Jeng JH, Lu HK, Hou LT. Treatment of an osseous lesion associated with a severe palato-radicular groove: a case report. *J Periodontol*. 1992;63:708-712.
- [14]. Forero-López J, Gamboa-Martínez L, Pico-Porras L, Niño-Barrera JL. Surgical management with intentional replantation on a tooth with palato-radicular groove. *Restor Dent Endod*. 2015;40:166-171.
- [15]. Vermeersch G, Leloup G, Delmée M, Vreven J. Antibacterial activity of glass-ionomer cements, compomers and resin composites: relationship between acidity and material setting phase. *J Oral Rehabil*. 2005; 32:368-374.
- [16]. Paolantonio M, D’ercole S, Perinetti G, Tripodi D, Catamo G, Serra E, Bruè C, et al. Clinical and microbiological effects of different restorative materials on the periodontal tissues adjacent to subgingival class V restorations. *J Clin Periodontol*. 2004;31:200-207.
- [17]. Dragoo MR. Resin-ionomer and hybrid-ionomer cements: part II. human clinical and histologic wound healing responses in specific periodontal lesions. *Int J Periodontics Restor Dent*. 1997;17:75-87
- [18]. Attam K, Tiwary R, Talwar S, Lamba AK. Palatogingival groove: endodontic-periodontal management—case report. *J Endod*. 2010;36:1717-1720.
- [19]. Sharma S, Deepak P, Vivek S, Ranjan Dutta S. Palatogingival groove: recognizing and managing the hidden tract in a maxillary incisor: a case report. *J Int Oral Health*. 2015;7:110-114.
- [20]. Liji MP, Rameshkumar M. Integration of PRF and biodentine in palatogingival groove case. *IOSR J Dent Med. Sci* 2013;6:26-30.
- [21]. Johns DA, Shivashankar VY, Shobha K, Johns M. An innovative approach in the management of palatogingival groove using Biodentine and platelet-rich fibrin membrane. *J Conserv Dent*. 2014;17:75-79.
- [22]. Attam K, Tiwary R, Talwar S, Lamba AK. Palatogingival groove: endodontic-periodontal management—case report. *J Endod* 2010;36:1717-1720.
- [23]. Anderegg CR, Metzler DG. Treatment of the palatogingival groove with guided tissue regeneration. Report of 10 cases. *J Periodontol*. 1993;64:72-74.
- [24]. Chang IC, Tsai CH, Chang YC. Platelet-rich fibrin modulates the expression of extracellular signal-regulated protein kinase and osteoprotegerin in human osteoblasts. *J Biomed Mater Res A*. 2010;95:327–32.
- [25]. Sharma A, Pradeep AR. Treatment of 3-wall intrabony defects in patients with chronic periodontitis with autologous platelet-rich fibrin: a randomized controlled clinical trial. *J Periodontol* 2011;82(12):1705–12.
- [26]. Thorat M, Pradeep AR, Pallavi B. Clinical effect of autologous platelet-rich fibrin in the treatment of intra-bony defects: a controlled clinical trial. *J Clin Periodontol* 2011;38(10):925–32.

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