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1 2 Treatment of a Mandibular Premolar with Uncommon Mesial and Distal Canal 3 Configuration with Triple Antibiotic PasteÂ” 4 5 Abstract 6 7 Endodontic failure often results from persistent microorganisms , debris in untreated or 8 inadequately prepared canals. Mandibular first premolars commonly present anatomical 9 variations, increasing the risk of missed canals and complicating treatment. 10 This case describes the retreatment of a mandibular first premolar in which a previously 11 undetected canal and an associated periapical lesion were identified. After thorough chemo 12 mechanical preparation, as a intracanal medicament Triple antibiotic paste was placed . The 13 medicament effectively reduced microbial load and promoted progressive healing. The canal 14 system was then obturated and restored, with follow-up radiographs confirming favorable 15 periapical repair. This report highlights the need for careful assessment of anatomical variations 16 in mandibular premolars and demonstrates that triple antibiotic paste can serve as a valuable 17 adjunct in retreatment cases with persistent periapical infection. 18 19 Key words : Anatomical variation, Missed canal ,Periapical lesion, Triple antibiotic paste, 20 Key Message : Identification of anatomical variations in mandibular premolars is essential to 21 prevent missed canals and endodontic failure. The triple antibiotic paste can significantly 22 enhance disinfection and support predictable healing during retreatment of persistent 23 periapical infections. 24 25 26 27 Introduction : 28 Failure to disinfect and obturate all anatomical spaces, particularly in teeth with complex 29 canal morphology, can result in persistent intraradicular infection and subsequent post30 treatment disease.[1] Mandibular first premolars are widely recognized for their anatomical 31 variability, which often complicates treatment procedures. Although a single canal configuration 32 is most frequently observed, several studies have reported a considerable incidence of 33 additional canals and atypical configurations, making these teeth among the most challenging 34 to manage.[2] 35 Slowey described mandibular premolars as some 2 of the most difficult teeth to treat due to their 36 unpredictable internal anatomy.[3] Missed anatomy

remains a significant etiologic factor in 37 endodontic failure, and retreatment cases often exhibit untreated or partially treated canals.[4] In 38 such situations, persistent microbial contamination within anatomical irregularities or 39 inaccessible areas is a major concern. 40 8 Intracanal medicaments serve as an essential adjunct in achieving deeper disinfection when 41 instrumentation and irrigation alone are insufficient. 5 Triple antibiotic paste (TAP), a combination 42 of metronidazole, ciprofloxacin, and minocycline, has demonstrated broad antimicrobial action 43 against polymicrobial endodontic infections due to the complementary mechanisms of its 44 components.[5] Its effectiveness 9 in managing large periapical lesions and in cases requiring 45 enhanced disinfection has been well documented.[6] However, reports describing the nonsurgical 46 retreatment of mandibular premolars with previously missed canals using TAP remain limited in 47 the literature. 48 The present case is distinctive as it documents the successful nonsurgical retreatment of a 49 2 mandibular first premolar with a previously undetected canal and an associated periapical 50 lesion, managed effectively with triple antibiotic paste. The combination of rare canal 51 morphology, missed anatomy, and the incorporation of TAP 1 as an intracanal medicament 52 underscores the clinical relevance and uniqueness of this case. 6 53 54 55 56 57 58 59 60 61 Case Report 62 A 32-year-old male patient came to the Department with a complaint of severe pain in the 63 lower left posterior region for the past three days. The pain was persistent and showed no 64

association with diurnal or postural variations. Dental history 4 revealed that the patient had 65 undergone root canal treatment on the mandibular left first premolar approximately four 66 months earlier. There was no medical history. 67 Clinical examination showed that the mandibular left first premolar was tender on percussion, 68 with no evidence of swelling, sinus tract, or periodontal pocketing. An intraoral periapical 69 radiograph revealed inadequately obturated canals, a widened periodontal ligament space, and 70 a periapical radiolucency. Based 1 on the clinical and radiographic findings, a diagnosis of 71 symptomatic apical periodontitis associated with a previously treated tooth was

established, 72 and nonsurgical endodontic retreatment was planned. 73 Endodontic Procedure 74 Local anaesthesia was administered using 2% lidocaine containing 1:80,000 adrenaline, Isolation 75 through rubber dam and access was re-established with an EndoAccess bur (Size 2; Mani Inc., 76 Japan). The previously placed composite restoration was removed, following which the gutta77 percha in the obturated canal was softened with gutta-percha solvent (RC Solve®, Prime Dental 78 Products, India) and mechanically retrieved using a No. 25 H-file. The chamber was flushed with 79 sterile saline to remove remnants of filling material. 80 Working length was determined using an apex locator (Root ZX®, J. Morita) and confirmed 81 radiographically, measuring 16 mm for the buccal canal and 17 mm for the lingual canal. 82 Cleaning and shaping were initiated with #10 and #25 K-files, followed by enlargement with 83 ProTaper hand files up to size F1 . Irrigation was carried out using 5.25% sodium hypochlorite 84 and 17% EDTA (SmearClear™, SybronEndo, USA), followed by a final saline rinse. 85 A triple antibiotic paste (TAP) was placed as an intracanal medicament. At the third 86 appointment, 7 the patient was asymptomatic. The TAP dressing was removed using copious 87 saline irrigation. 88 Master cone selection was performed, and obturation was completed using F1 gutta-percha 89 cones and AH Plus sealer by the single-cone technique. 4 The access cavity was restored 90 subsequently. 91 92 Discussion : 93 Mandibular premolars often exhibit considerable anatomical variability, making their 94 endodontic management challenging. Variations such as additional canals can complicate 95 debridement and obturation, leading to persistent infection if not identified. Missed anatomy is 96 a well-recognized cause of endodontic failure, with Hoen and Pink reporting that 42% of 97 retreatment cases were attributed to undetected canals (7). Moreover, Al-Attas and Al-Nazhan 98 described 2 a mandibular second premolar with three canals in which failure occurred due to a 99 missed third canal, identified only after modifying the access cavity during retreatment (8). Such 100 cases reinforce the importance of careful exploration 1 and the use of advanced diagnostic aids 101 when treating teeth with suspected

anatomical complexities. 102 Epidemiological data from the University of Washington showed failure rates of 11.45% in 103 mandibular first premolars and 4.54% in mandibular second premolars, highlighting the 104 influence of complex anatomy on treatment outcomes (9). When patients continue to report 105 postoperative pain or sensitivity after root canal therapy, clinicians should strongly suspect 106 untreated or missed canals, particularly in premolar teeth. 107 Odontogenic infections are typically polymicrobial, involving aerobes and anaerobes. In chronic 108 infections, the intricate canal anatomy protects microbial biofilms from mechanical preparation 109 and irrigation, making eradication difficult. Because single-agent intracanal medicaments may 110 be insufficient, combinations such as triple antibiotic paste (TAP) have gained prominence. TAP, 111 composed of ciprofloxacin, metronidazole and minocycline, provides broad antimicrobial 112 activity against gram-positive, gram-negative, facultative and obligate bacteria, enhancing 113 disinfection and promoting periapical healing (10-12). 114 In the present case, endodontic failure resulted from a missed canal that harboured persistent 115 infection and caused a periapical lesion. During retreatment, the use of TAP as an intracanal 116 medicament facilitated disinfection of the complex canal system. The clinical resolution 117 achieved emphasizes the importance of thorough anatomical assessment, adequate access 118 refinement, and evidence-based use of intracanal medicaments in managing retreatment cases 119 with previously undetected canals. 120 121 Conclusion 122 Missed canals remain a significant contributor to endodontic failure, especially in teeth with 123 anatomical variations such as mandibular premolars. This case demonstrates the necessity of 124 careful radiographic interpretation, proper access cavity design and the use of enhanced 125 diagnostic techniques to locate additional canals. The application of triple antibiotic paste 126 proved valuable in eliminating persistent infection, supporting periapical healing and improving 127 the retreatment outcome. Comprehensive knowledge of anatomical variations and meticulous 128 clinical execution are essential for successful management. 129 130 131

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165 Figure 1: Pre-op wrt 34 166 167 168 169 170 171 172 173 174 175 Figure 2: Guttapercha removed wrt 34 176 177

F 178 Figure 3 : Working length taking wrt 34 179 180 181 Figure 4 : Working

length xray wrt 34 182 183

184 185 Figure 5 : Manipulation of Triple antibiotic paste for the placement inside the canal as 186 Intracanal medicament wrt 34. 187 188

189 Figure 6 : Master cone x ray wrt 34 190 191 192 Figure 7 : Obturation xray wrt 34 193 194

195 Figure7 : POST-OP(after 1 month) wrt 34 196 197 198 199

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