Sinus tracts from proximal roots with infected root canals — cases report

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Diagnosis of the infection source of a sinus tract is sometimes complex. We present 3 cases of sinus tract originating from infected root canals of neighboring teeth. In case 1, a sinus tract on the buccal gingiva of the right mandibular 2nd molar was found to be originated from the necrotic distal root canal of the right mandibular 1st molar. In case 2, a sinus tract was found on the buccal furcation area of the right mandibular 2nd molar. Tracing the sinus tract by gutta-percha point indicated that the origin was from the distobuccal root of the right mandibular 1st molar. In case 3, a sinus tract on the buccal gingiva of the left mandibular 1st molar was found to have been derived from an apical lesion of the left mandibular 2nd premolar. In all 3 cases, all sinus tracts healed after endodontic treatment. We would like to emphasize that a sinus tract may originate from adjacent teeth with infected root canals. Therefore, radiographic confirmation after tracing the sinus tract with a gutta-percha point may help diagnose the origin of the infection source. (J Dent Sci, 1(4): 202-206, 2006)

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The key to successful endodontic treatment is a proper diagnosis. To establish an accurate diagnosis, clinicians must use all facilities that contribute to the final diagnosis and a proper treatment plan, including medical and dental histories, visual examination, palpation, percussion, probing depth, tooth mobility, electric pulp test, thermal test as well as different kinds of radiography. Generally, the presence of a sinus tract in the oral mucosa indicates underlying necrosis of the dental pulp, periapical suppuration, or periodontal destruction of teeth, which leads to resorption of the apical bone, or the buccal or lingual cortical plate and the mucoperiosteum, reaching the mucosal surface where it drains. Gupta and Hasselgren evaluated 393 endodontically treated teeth and found 29 teeth (18.1%) with an associated odontogenic sinus tract¹. Mortensen et al. studied 1600 teeth with periapical lesions and discovered 136 teeth (9%) with adjacent sinus tracts². Huang et al. evaluated 678 teeth, which required endodontic treatment, and found that 86 teeth (12.7%) were accompanied by a sinus tract³. By following the principles of clinical history taking and local examination, making an accurate diagnosis of the offending teeth or dentigerous lesions responsible for the sinus tract is generally not difficult. However in some situations, sinus tracts are unexpectedly noted in a location far from the offending teeth⁴⁵ or originate from a periodontal infection⁶.

Most previous reports dealt with the prevalence of sinus tracts¹² and cutaneous sinus tracts³, but few reports have elucidated the characteristics and the diagnostic dilemma of sinus tracts in the oral mucosa, which are often encountered in clinical practice. Generally, sinus tracts can carefully be traced with a gutta-percha point and a radiograph taken to locate the origin of the infection. Some cases may defy
immediate diagnosis even after careful history taking and examination. We report 3 cases with sinus tracts over the buccal attached gingiva. Interestingly, all of the sinus tracts originated from an infected root canal of adjacent teeth. Two cases originated from the adjacent 1st molars with close distobuccal roots. Treatment of these cases suggests the need for careful diagnosis of the oral sinus tract and treatment planning to avoid clinical mistakes.

**CASE PRESENTATION**

**Case 1**

A 54-year-old female patient visited the endodontic clinic for treatment of a localized abscess over the right mandibular 2nd molar (Figure 1A) for about 2 months. Her past dental history revealed that endodontic treatment of the right mandibular 2nd molar had been carried out with slight material overfilling of the distal root, but the periodontal probing depths were within a normal limit. Periapical radiography revealed a post within the root canal, diffuse periodontal ligament (PDL) widening, and small apical bone loss around the right mandibular 2nd molar, indicating the possible presence of a root fracture or residual root canal infection leading to sinus tract formation. However, tracing with a #25 gutta-percha point could not directly confirm whether the sinus tract originated from the 2nd molar apical region (Figure 1B). We found the loss of response to the electric pulp test of the adjacent right mandibular 1st molar with prior amalgam restoration. A radiolucent lesion was detected in the periapical area of the proximal distal root of the right mandibular 1st molar. We therefore decided to endodontically treat the right mandibular 1st molar first and intriguingly found that the 1st molar had 4 root canals. Partial obstruction of the distolingual canal was found during canal preparation. An electronic apex locator (Root-ZX) and radiographic checking were used to confirm the working length. A curvature of the DB canal toward the buccal side was detected. The root canals were cleaned with a 2.5% NaOCl solution and shaped with K-flexo files. After canal enlargement/debridement and placing a root canal dressing of Ca(OH)₂ for 9 days, the sinus tract disappeared. (D) Root canals were filled with gutta-percha points and canals® sealer by lateral condensation, and the coronal cavity was sealed with intermediate restorative material (IRM). (E) Clinical photograph showing healthy buccal gingivae over the right lower 1st and 2nd molars 2 years after completion of endodontic treatment. (F) Periapical radiograph showing bone healing in the periapical area of the right lower 1st molar.

**Figure 1.** (A) An abscess with a sinus tract was found on the buccal gingiva of the right mandibular 2nd molar. (B) Tracing with a #25 gutta-percha point could not confirm whether the origin of the sinus tract was from the right mandibular 2nd or 1st molar. The proximity of the distal root of the 1st molar to the 2nd molar was detected from the periapical radiograph. (C) After root canal enlargement and debridement followed by a Ca(OH)₂ dressing for 9 days, the sinus tract disappeared. (D) Root canals were filled with gutta-percha points and canals® sealer by lateral condensation, and the coronal cavity was sealed with intermediate restorative material (IRM). (E) Clinical photograph showing healthy buccal gingivae over the right lower 1st and 2nd molars 2 years after completion of endodontic treatment. (F) Periapical radiograph showing bone healing in the periapical area of the right lower 1st molar.
days, the abscess completely disappeared (Figure 1C). Root canals were filled with gutta-percha points and sealer (canals®, Showa, Japan) by lateral compaction, and the coronal cavity was sealed with intermediate restorative material (IRM) (Figure 1D). Amalgam filling was then used, and no evidence of abscess recurrence was noted after 2 years of follow-up (Figure 1E). A radiographic examination revealed bone healing in the periapical region of the right mandibular 2nd molar (Figure 2F).

Case 2

An 82-year-old female patient visited our endodontic clinic for a localized abscess with a sinus tract on the buccal gingiva of the right mandibular 2nd molar. No dental caries of that tooth was detected by clinical examination. The periodontal probing depths of the right mandibular 2nd molar were within a normal range, and the vitality test was also normal. Clinical examinations revealed that the right mandibular 1st molar had a large restoration, and showed a negative response to the electric pulp test. Radiographic tracing of the sinus tract with a #30 gutta-percha point indicated that the sinus tract originated from the proximity of the distal root apex of the right mandibular 1st molar. A periapical radiolucency was also noted at the periapical area of the mesial root of 1st molar (Figure 2A). After access preparation, 4 canals were found in the right mandibular 1st molar. An electronic apex locator (Root-ZX) and radiographic checking were used to determine the working length. Root canal enlargement and debridement were performed using K-flexo files. RC-Prep and a 2.5% NaOCl solution were used for root canal lubrication and irrigation, respectively. Following root canal filling of the right mandibular 1st molar with gutta-percha points and sealer (canals®) by lateral compaction (Figure 2B), healing of the sinus tract was noted. However, the patient did not return for a subsequent recall probably due to a lack of symptoms. This patient was lost to further follow-up.

Case 3

A 17-year-old female patient was referred from our pediatric department for treatment of a sinus tract on the buccal gingiva of the left mandibular 1st molar (Figure 3A) for about 1 month. A large amalgam restoration with secondary caries of the 1st molar was noted. However, the pulp vitality test of the 1st molar was positive. The periapical radiograph taken after tracing the sinus tract with a #30 gutta-percha point revealed that the sinus tract originated from a radiolucent lesion in the periapical area of the left mandibular 2nd premolar (Figure 3B). A central cusp was detected on the occlusal surface of the 2nd premolar. Endodontic treatment of the 2nd premolar was performed. After inter-appointment root canal dressing with Ca(OH)₂ paste, MTA was used for an apical barrier due to a slightly open apex. A warm gutta-percha technique (Obtura II) was used to fill the coronal part of the root canal. The sinus tract had disappeared (Figure 3C), and the periapical lesion had healed at the 1-year follow-up (Figure 3D).
DISCUSSION

Endodontic infection is often accompanied by drainage of the apical suppuration by a sinus tract. Thus an accurate diagnosis is important because the sinus tract may be derived from other reasons such as a root fracture, periodontal breakdown, pulp necrosis of an adjacent tooth, chronic osteomyelitis, etc. Thus, the length of the sinus tract and the position of the orifice of the sinus tract can markedly vary due to a number of factors. In these 3 cases, even the etiology of the sinus tract was initially suspected of being associated with a root fracture or periodontal destruction, but an apical suppurative infection in the adjacent teeth was eventually found to be the contributing factor. The difficulty in making a diagnosis in case 1 was due to the presence of concomitant lesions over the teeth relevant to the sinus tract and the presence of an apical radiolucency. Therefore, adequate treatment planning should rely on accurate history taking, and clinical and radiographic examinations to avoid possible errors. If an accurate diagnosis is not feasible, a more-conservative approach should first be chosen.

An odontogenic abscess usually drains along a pathway of least resistance, resulting in an intraoral or extraoral sinus tract, where the location of the perforation in the cortical plate and its association with facial-muscle attachment is a critical factor\(^1\). The presence of sinus tracts should not influence the long-term outcome of endodontic treatment\(^1\). A sinus tract may drain into the labial/buccal mucosa (27 cases), palatal side (1 case), and gingival sulcus (1 case), suggesting that the palatal and lingual cortical bones are possibly more compact or thicker than the labial/buccal cortical bone. Huang et al. reported 86 cases of endodontic lesions with a sinus tract and found that most of the sinus tracts drained from the labial/facial (70/86), followed by 7 cases extraorally, 4 cases lingually, 2 cases each palatally or on both surfaces, and 1 case distally\(^2\). Our prior study also found that sinus tracts even drained into the cutaneous region in 37 cases\(^3\). In the present 3 cases, all sinus tracts had openings in the buccal mucosa adjacent to the actual offending teeth. Lingual cortical bone is

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Figure 3. (A) A sinus tract found on the buccal gingiva of the left mandibular 1st molar. (B) After tracing with a #30 gutta-percha point, the origin of the sinus tract was found to be from the periapical lesion of the left lower 2nd premolar. (C) The sinus tract disappeared after endodontic treatment of the left lower 2nd premolar. (D) The apical lesion had healed 1 year after root canal filling with MTA and warm gutta-percha.
generally more compact than buccal cortical bone, thus bone destruction often leads to sinus tract formation on the labial/buccal side. The size of the apical lesion is also shown to be 1 of the reasons affecting whether there is a sinus tract over the oral mucosa. In this report, 1 of our cases (case 2) involved the mandibular molars with an additional distolingual root. This raises an interesting issue of whether suppurative infection of a curved distobuccal root will sometimes lead to a sinus tract draining in the adjacent second molar, especially in the presence of root proximity. The prevalence of 3-root mandibular first molars was found in a review to range from 0% in Australian aborigines and African Bantu to about 5.8%~21.5% in Chinese and up to 32% in Eskimos. Root proximity and inclination of the distal root as well as the location of the apical foramen in the infected adjacent teeth may possibly lead to drainage of suppuration in the neighboring teeth. Whether the presence of an ectopic sinus tract is associated with a distobuccal root with root proximity in an adjacent tooth is an intriguing issue which should be addressed in the future.

Clinically, the gutta-percha tracing technique can be used (i) to determine whether a sinus tract originates from a lesion at the apex of a tooth, from a periodontal lesion, or from a lesion of the periosteum. (ii) Moreover, this technique is helpful for determining whether an apical infection of some teeth is responsible for this suppurative lesion, especially in the presence of 2 or more adjacent apical radiolucencies, (iii) when the offending tooth has acute inflammation, where accumulation of pus cause mucosal swelling and fluctuation, whereas a sinus tract has not yet developed, or (iv) to trace the origin of sinus tracts found in edentulous regions at various distances from the remaining natural teeth. However, in 1 of our cases, tracing the sinus tract by gutta-percha was not able to define the offending tooth, possibly due to the tortuous nature of the sinus tract.

This reveals that gutta-percha tracing is technically sensitive, and one may need to estimate the pathway of the sinus tract prior to application of gutta-percha.

Future perspectives are to evaluate whether variations in the anatomy, morphology, and distribution of roots, such as root proximity, may affect the drainage pathways of an apical abscess, and whether an ectopic sinus tract is more commonly noted when the adjacent distal root of the molars has 2 rather than 1 canal.

Root proximity may be the potential reason responsible for the occurrence of an ectopic sinus tract. The 3 case reports suggest the need for an accurate diagnosis of the oral sinus tract and subsequent treatment planning to avoid clinical misdiagnosis of the affected tooth. Careful examination of the pulp vitality, probing depth, carious lesion, and a diagnostic radiograph after gutta-percha tracing in the offending tooth can be helpful for the clinical management of these cases.

REFERENCES