# Prevalence of odontogenic sinus tracts in patients referred for endodontic therapy

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**ABSTRACT**

**Objectives:** The primary aim of this study was to assess the prevalence, location and distribution of odontogenic sinus tracts in a population of Turkish adult patients referred for endodontic therapy. The second aim was to investigate the influence of the factors such as sex, age, systemic disease, existence and diameter of periapical radioluceny on the prevalence of the clinically detected sinus tracts among Turkish population.

**Materials and Methods:** A total of 499 patients' records according to the demographic data and the presence of periapical radiolucency and of sinus tract were included to the present study. The location of the sinus tracts was recorded as well. Data were analyzed using Pearson chi-square and Fisher's Exact Tests (p=0.05).

**Results:** The number of teeth with sinus tracts was 37 (7.4%). Sixteen of 37 teeth with sinus tracts were associated with posterior teeth (43%). No significant differences were found in the prevalence of sinus tracts between two genders (p>0.05). 40-50 year age group showed the highest prevalence of sinus tracts.

**Conclusions:** Approximately one in thirteen teeth referred for root canal treatment had a sinus tract. Fourty-three percent of sinus tracts were associated with posterior teeth with high prevalence of openings in buccal aspects of the gingiva. Therefore, practitioners should be careful while examining posterior teeth referred for endodontic treatment.

**Keywords:** Odontogenic, sinus tract, prevalence.

## INTRODUCTION

A sinus tract of endodontic origin is caused by pulp necrosis followed by invasion of microorganisms causing an inflammatory lesion in the periapical area of the affected tooth. Chronic dental infection penetrates the alveolar bone and forms a path for drainage erupting either intra-orally or extra-orally.[1,2] Intra-orally, the opening is usually visible on the attached buccal gingiva or in the vestibulae. An extra-oral opening or cutaneous sinus tract may open anywhere on the face and/or neck. When the exudate has found its way to the surface of the skin, differential diagnosis of cutaneous orifice may include squamous cell carcinoma, osteomyelitis, pyogenic granuloma, actinomycosis, foreign body reaction, a chronic tuberculosis lesion, and gamma of tertiary syphilis.[3]

In advanced stages, periapical radiolucency may be observed on the radiograph.[4] Definitive treatment of the draining sinus tract requires elimination of the source of infection by root canal therapy.[5-7] Once the source of the infection has been eliminated, by disinfection of the pulpal space of the involved tooth, the sinus tract should heal within a few days without further treatment.[8]

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Since many patients with sinus tract do not have any complaints, these lesions are often misdiagnosed and generally overlooked and accordingly either not treated or treated ineffectively.[9] It has been estimated that half of the patients with oro-facial fistula are submitted to multiple dermatological surgical operations and long-term antibiotic therapy before the correct diagnosis is established.[10] Early diagnosis and treatment of these lesions may help prevent unnecessary and ineffective antibiotic therapy or invasive surgical treatment. Thus, it is important to reveal the prevalence of odontogenic sinus tracts in order to increase the awareness thereby to accelerate diagnosis and treatment.[11]

Review of the literature revealed that several studies have reported the presence of sinus tracts[12-14], but only a few of them have dealt with their prevalence.[4,11,15] Single study investigated the prevalence of sinus tracts in endodontically treated teeth however, only in an Iranian population.[15] There is no published data examining the prevalence of odontogenic sinus tracts in a Turkish population. Therefore, the primary aim of this study was to assess the prevalence, location and distribution of odontogenic sinus tracts in Turkish adult patients referred for endodontic therapy. The second aim was to investigate the influence of the factors such as sex, age, systemic disease, radiographic existence and radiographic diameter of periapical radioluceny on the prevalence of sinus tracts among Turkish population.

## MATERIAL AND METHODS

A total of 499 patients with non-vital teeth referred for endodontic consultation to the Ege University, School of Dentistry during one year period were included to the present study. An informed consent form was taken from all patients concerning their validation of being a participant of the study. Data regarding age, sex and systemic health status and presence of sinus tract were collected by a single examiner who is specialist in endodontics using a pre-prepared questionnaire (Table 1). Patients'age ranged from 15-70 years, while the gender distribution was 217 males and 282 females. Questions regarding the general health status included the commonly encountered systemic diseases (such as coronary artery disease, cardiovascular systemic disease and diabetis mellitus) (Table 1). The patients having a systemic disease but not receiving any treatment or patients treated with drugs that would affect bone metabolism were excluded.

When a sinus tract was observed, the location of the sinus tract was classified as: mesial/distal, buccal/palatinal, apical/cervical according to the root of the related tooth. The prevalent origin of the sinus tracts were infected root canals caused by either necrotic pulp or a big caries. As already mentioned the aim of this study was to reveal the prevalence, location and distribution of sinus tracts to create an awareness regarding its diagnosis. Therefore; the aetiology of the sinus tracts was irrelevant and accordingly no efforts were made for further diagnosis of its origin.

Radiographic imaging was performed using no.2 size (41x31 mm) blue storage phosphor plates (SPP) of the Digora Optime (Soredex Corporation, Helsinki, Finland) system. All images were acquired using paralleling technique projection geometry. For the standardization of the exposure geometry, a plate holder was attached to the x-ray tube and the central beam was aligned perpendicular to the SPPs. A Gendex Oralix DC (Gendex Dental Systems, Milan, Italy) dental x-ray unit operating at 60 kVp, 7 mA, and 1.5 mm Al equivalent filtration at a focus-receptor distance of 25 cm and a exposure time of 0.12 s was used for all exposures. SPPs were scanned immediately after exposure using the Digora Optime scanner and the resulting images were transferred

**Table 1**. Questionnaire used collecting data regarding age, sex and general health status and presence of sinus tract.

| **Demographic information:** | |
|---|---|
| **Name-Surname:** | |
| **ID number:** | |
| **Sex:** | |
| **Age:** | |
| **General health status:** | |
| **Systemic disease:** | YES NO |
| | coronary artery disease |
| | cardiovascular disease |
| | diabetes mellitus |
| | other |
| **Dental status:** | |
| **Tooth number:** | Incisor Canine Premolar Molar |
| **History of root canal treatment:** | YES NO |
| **Existence of periapical lesion:** | YES NO |
| **Diameter of periapical lesion:** | <5mm >5mm |
| **Existence of sinus tract:** | YES NO |
| **Location of the sinus tract:** | Maxilla Mandible<br>mesial middle distal<br>buccal palatinal<br>apical cervical |

as 8-bit TIF files to a personal computer (Toshiba Satellite 1900, Toshiba Corp., Tokyo, Japan). A 10-mm rectangular orthodontic wire was mounted on each plate as a calibration control for the measurement of diameter of periapical lesions.

The widest diameter of periapical lesions were measured in both vertical and horizontal planes by one radiologist using the measuring tool of the dedicated software of the image plate system (Digora for Windows) for three times. Measurements were made on the digital images through use of a mouse-driven cursor to an accuracy of 0.1 mm and calibrated using the measurements done on ruler of the dedicated software of the image plate system. The mean was recorded and categorized according to the radiographic diameter of the radiolucency: greater or smaller than 5 mm.[13] Statistical analyses of the data was performed using Pearson chi-square and Fisher's exact test, level of significance set at p=0.05).

## RESULTS

Total of 499 non-vital teeth referred for endodontic consultation was evaluated. Table 2 shows the distribution of the teeth with sinus tracts. Sinus tracts were found in 37 of 499 teeth (7.4%). Sixteen of 37 teeth with sinus tracts were associated with posterior teeth (43%). Sinus tracts were originated in 65% of maxillary teeth and in 35% of mandibular teeth. The prevalence of sinus tracts in maxilla was significantly higher than mandible (p=0.001).

There was no significant differences for the prevalence of sinus tracts between two genders (p>0.05). In addition, no significant relationship was found between the prevalence of sinus tracts and age of the patients (p>0.05). However, 40-50 year

age group was the group showing the highest prevalence of sinus tracts. No correlation was found between the subjects' general health status and the presence of sinus tracts.

Location of the sinus tracts are presented in Table 3. All teeth except two (94 %) had sinus tracts with labial/buccal openings. Orifices on the palatina were typically observed in maxillary molars.

The radiographic evaluation revealed that 297 teeth (60%) had periapical radiolucency and 81 teeth had a previous root canal therapy (16.2%). Of 297 teeth with periapical radiolucency, 33 teeth (11%) had an odontogenic sinus tract. Sinus tracts were found in 9 of 81 teeth with previous root canal therapy (11%) (Table 4). The diameter of the periapical radiolucensies varied between 2.3 mm to 7.6 mm (mean and standard deviation: 4.8 ± 0.08). Distribution of the sinus tracts according to the diameter of the periapical radiolucency revealed that the prevalence of the sinus tracts demonstrating periapical radiolucency with diameter less than 5 mm (75%) was higher than the ones with diameter greater than 5 mm (25%).

**Table 2.** Distribution of the teeth with sinus tracts (n=37).

| | **Incisor No of teeth (%)** | **Canine No of teeth (%)** | **Premolar No of teeth (%)** | **Molar No of teeth (%)** | **Total No of teeth (%)** |
|---|---|---|---|---|---|
| **Maxilla** | 9 (24%) | 6 (17%) | 4 (10%) | 5 (14%) | 24 (65%) |
| **Mandible** | 1 (3%) | - | 1 (3%) | 11 (29%) | 13 (35%) |
| **Total** | 10 (27%) | 6 (17%) | 5 (%13) | 16 (43%) | 37(100%) |

**Table 3.** Distribution of the location of the sinus tracts (n=37).

| | Buccal (%) | Palatinal (%) |
|---|---|---|
| Mesial of the related root | 9 (27%) | 1 (3%) |
| Middle of the related root | 9 (27%) | - |
| Distal of the related root | 17 (40%) | 1 (3%) |
| Total | 35 (94%) | 2 (6%) |

**Table 4.** Distribution of the sinus tracts according to the presence of periapical radiolucency and root canal treatment (RCT).

| | **Periapical Radiolucency (+)** | | **Periapical Radiolucency (-)** | |
|---|---|---|---|---|
| | **RCT (+)** | **RCT (-)** | **RCT (+)** | **RCT (-)** |
| **Number of sinus tracts** | 8 (21.6%) | 25(67.5%) | 1 (2.7%) | 3(8.2%) |

RCT (+): teeth with root canal treatment
RCT (-): Teeth without root canal treatment

## DISCUSSION

Sinus tracts of dental origin most commonly open into the oral cavity and extra-oral drainage is relatively uncommon. In this study, all odontogenic sinus tracts had intra-oral openings. In accordance with the previous reports no significant relationship was observed among the prevalence of sinus tracts and factors such as age, sex and subjects' general health status.[4,15]

Our results revealed that sinus tracts were more frequently involved maxillary teeth (65%) than mandibular teeth (35%). In addition, the majority of the sinus tracts had labial openings (94%). It is well known that mandibular teeth are embedded within a thicker cortical bone compared to maxilla and that lingual bone is more compact than the buccal bone for both jaws. These characteristics related to upper jawbone may explain the higher incidence of sinus tracts with labial openings in maxilla.

The findings of the present study also revealed that the majority of sinus tracts were associated with posterior teeth (43%). The first molar teeth are the first erupted permanent teeth in the mouth, more susceptible to dental caries and therefore, are the most common teeth to undergo endodontic treatment or extraction.[16] Consequently, the higher incidence of sinus tracts for posterior teeth may be naturally expected.

Even though the findings of the present study as regards to the distribution and location of the sinus tracts were in accordance with many previous studies[4,11,17], it was contradictory to the findings of Sadeghi et al. who found higher prevalence in anterior mandibular teeth.[15] Although the patients' age range (10-69) was similar with our study, they found that the highest prevalance of sinus tracts was in 10-19 year age group. Dental trauma which is one of the possible dental causes of odontogenic sinus tracts, is a significant problem in young people. Recent studies revealed that anterior teeth were found to be most affected by trauma among children.[18-20] Although Sadeghi et al. did not explain any possible reason for their conflicting results, the higher incidence of dental trauma of anterior teeth in young people may be the reason for the highest prevalance of sinus tracts in younger age group.

The results of the present study showed that of 37 out of 499 teeth had sinus tracts (7.4%). This was lower than the previous reports with 18.1%, 9.7%, 14.7% and 9% prevalences.[4,11,15,21] It should be noted that, most of the studies evaluating the prevalence of sinus tracts included teeth with periapical lesions.[11,21] However, in this study all teeth (with or without periapical lesion) were evaluated. Similar to the previous findings, the incidence of

sinus tracts in teeth with periapical radiolucency was also high (11%) in this study. Moreover, the teeth with periapical radiolucency less than 5 mm in diameter were more frequently associated with sinus tracts than those with greater lesions (25%). This was explained by the fact that due to the drainage through the sinus tract, the pressure inside the lesion will be lower and therefore less bone will be resorbed resulting in smaller sized lesions.[21,22]

According to the results obtained, approximately one in thirteen teeth (37/499) referred for endodontic consultation had a sinus tract. In addition, most of the sinus tracts were associated with the posterior teeth. Therefore, practitioners should be careful while examining posterior teeth referred for endodontic treatment.

Many patients with odontogenic sinus tract undergo multiple inappropriate and/or unnecessary therapies due to overlook during diagnosis.[23] Early diagnosis and accordingly appropriate endodontic therapy provides permanent solution for the sinus tracts. If overlooked and accordingly not treated properly, needless treatment options such as multiple biopsies, antibiotic regimens and unnecessary surgery or extraction may be required.[24] Thus, it is important for clinicians to be aware of the prevalence and frequent location of odontogenic sinus tracts and to have high degree of alertness in order to accelerate the diagnosis and to implement appropriate treatment resulting in rapid healing of these lesions.

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