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# Sinus Tract vs. Fistula: There is a Difference

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# Sinus Tract vs. Fistula

## There is a Difference

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ABSTRACT

**The terms sinus and fistula have been used interchangeably in clinical dentistry, but it may be inconsistent with past and current literature. The primary difference between the two is the number of anatomic spaces or openings involved. There is often confusion regarding the lining of a sinus tract and of a fistula. This article will review the clinical and histological features of a sinus and a fistula in both dentistry and medicine.**

The Latin meaning of the word sinus is a "curve or bend or deepest part inside something."[1] A sinus is a draining tract (hence, sinus tract) that has one abnormal narrow opening, or stoma, that is often referred to as a "blind-ended tract." In dentistry, a sinus tract originates from other locations, including the apex of a tooth (not considered an opening) to another structure or tissue, such as the oral cavity, skin or anatomic space (which are openings) for drainage of the infection.[2]

The pathway of a sinus tract that develops from a necrotic pulp is through the alveolar bone and emptying purulent exudate into the oral cavity. The stoma can be on the attached gingiva, alveolar mucosa or gingival sulcus. It can also empty on the buccal or lingual surface (Figures 1A, B). This is determined by the proximity of the apex to either the cortical plate and/or the density of the bone. Finally, it can also drain extraorally (cutaneous sinus tract) (Figures 2A, B).[3-5]

Extraoral sinus tracts may result in a small scar on the skin and are usually misdiagnosed in the medical community before it is

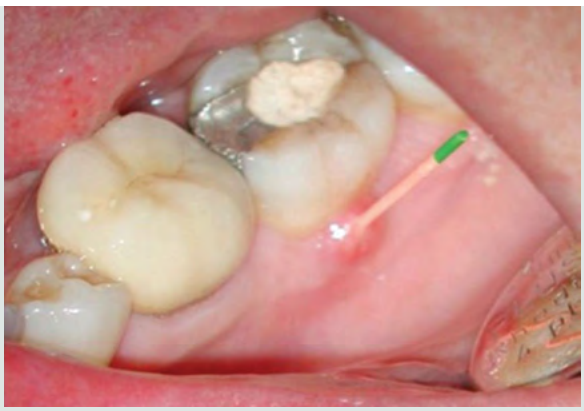

**Figure 1A:** Patient was referred to endodontist for evaluation because sinus opening had not healed after endodontic therapy on lower left second molar. Patient was asymptomatic and had been so prior to initiation of therapy; however treatment was initiated because of diagnosis of sinus tract opening facial to second molar

**Figure 1B:** Sinus tract was traced with size 35 gutta-percha. Periapical radiograph revealed origin of sinus tract was periapical lesion associated with distal root of first molar not second molar, indicating possibly wrong tooth had been treated.

realized it is a sign of dental infection.[6] Essentially, a sinus tract develops as a mechanism of drainage of exudate from an infected root canal system. While bacteria are usually confined within the root canal system,[7] Ricucci et al., found that a majority of teeth with associated sinus tracts have extraradicular biofilm with bacteria present on the outer surface of the root.[8] Sinus tracts have been shown to develop in fractured teeth and rare cases of vertical fractures presenting with multiple sinus tracts.[9] Sinus tracts of odontogenic origin can also drain into the nasal opening.[10] Differential diagnosis of cutaneous sinus tracts includes carcinomas, osteomyelitis of the jaw, salivary gland lesions and actinomycosis.[11,12]

It is the same concept in medicine, where a sinus tract or tunneling wound originates from the surface of an organ (if it's a hollow organ, it is called a fistula) or a wound underneath the skin (not an opening) and travels in one direction through soft tissue or to an underlying area or abscess cavity (an opening). Other medical examples include pressure ulcers and a skin condition called hidradenitis suppurativa.[13-15]

Histologically, the majority of studies report that the sinus tract is lined with granulomatous tissue. Harrison and Larson concluded that some sinus tracts extending from the apex of the tooth to the oral mucosa may be lined with epithelium; however, more are likely to be lined with chronic inflammatory cells (granulomatous tissue).[16,17] Baumgartner found two-thirds of sinus tracts had epithelium with only granulation tissue past the rete ridges and one-third had epithelium the entire length.[18] In longstanding, chronic untreated sinuses and fistulae, there may be a downgrowth of epithelium from the mucosal surface.[3,16,19]

Healing of sinus tracts from lesions of endodontic origin occur when the root canal system is disinfected enough to reduce the bacterial load to a level that is compatible with tissue healing. Granulomatous tissue in a periapical lesion cannot be removed directly by root canal treatment unless an apicoectomy is done.

## Fistula

The Latin meaning of the word fistula is "pipe" or "tube."[20] A fistula, in contrast to a sinus tract, is an abnormal narrow pathway or communicating channel between two anatomic spaces or openings, such as from the maxillary sinus (mucous surface) to the oral cavity (mucous surface) or from the oral cavity to and through the alveolar bone. For example, during an extraction, the lingual root of a maxillary first premolar is pushed into the sinus, resulting in an infection and drainage into the oral cavity. If this is not repaired, a fistula will develop between the maxillary sinus (one space) and the oral cavity (the other space), creating what is known as an oroantral fistula.[21]

In medicine, a fistula is an abnormal tract communicating between a hollow organ (e.g., small intestine, large intestine, stomach) and the surface of the skin. Some examples of a medical fistula are recto-vesical fistula, perianal fistula (seen in Crohn's disease) and gastro-colic fistula.[13] Histologically, a fistula is lined with epithelium that may or may not be filled by granulomatous tissue.[22-26]

**Figure 2A:** Patient reported to clinic with history of persistent "pimple" on her chin. Plastic surgeon had excised pimple, but it reappeared within few weeks.

**Figure 2B:** By gently removing existing scab, sinus opening was evident. It was traced with size #25 gutta-percha cone to lower right central incisor that was unresponsive to cold and EPT.

## Discussion

Considering the clinical and histological articles reviewing sinus tracts and fistulas, there is a difference between these two terms. The differences between the two terms are based on anatomical features and histology. A sinus is a tract or an abnormal narrow channel that originates or ends in one opening or stoma. An example is a necrotic pulp where the infection starts from the apex of the tooth, which is the closed space, and travels through the alveolar bone to end in the oral cavity (gingiva), which is the one opening.

In contrast, a fistula is a tract or abnormal narrow channel between two anatomic openings or spaces. An example is an oroantral fistula that starts in the maxillary sinus (first opening)

and ends in the oral cavity or skin (second opening). Histologically, a preponderance of literature shows that the majority of the lining or walls and periapical area of sinus tracts are composed of chronic inflammatory granulomatous tissue. Healing occurs when bacteria are removed from the canal and the process of osteoclastogenesis stops. Since the two terms have frequently been used interchangeably, histologic reports may not be accurate, since many articles use the term sinus tract to include a fistula tract and the histologist may be using these terms substitutable.

The American Academy of Endodontists Glossary of Endodontic terms distinguishes between the two terms and states that "A sinus tract is a pathway from an enclosed area of infection to an epithelial surface. The term fistula is often inappropriately used." A fistula is defined as "an abnormal communication pathway between two internal organs or from one epithelial lined surface to another epithelial-lined surface; it is not a sinus tract."[27] Additionally, a fistula only pertains to a medical or oral, not tooth, condition.

Sinus tracts can also originate from any surface of a dental implant. Tracing the exact site with gutta-percha or a CBCT may be necessary to determine exactly where the infection is coming from. In this paper, they interchanged fistula and sinus tract.[28] Additionally, purulent exudate from a chronic lateral periodontal abscess, or any periodontal abscess, can communicate with the oral cavity through the periodontal pocket or a sinus tract.

In conclusion, a draining infection from the apex of a tooth into the oral cavity should be correctly referred to as a sinus tract and not a fistula. Any draining infection from the maxillary sinus into the oral cavity or skin should be correctly referred to as a fistula or fistula tract. These two terms should not be used interchangeably, since they are two separate entities.

*Queries about this article can be sent to Dr. Segelnick at eperiodr@aol.com.*

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