Once the pulp tissue has become necrotic, the products of cellular degeneration, bacterial toxins, and occasionally the bacteria themselves within the canal spread through the apical foramen or the various lateral foramina into the surrounding periradicular tissue. A slow inflammatory process thus begins in the tissue contained within the periodontal ligament. Left to itself, it may manifest in a variety of ways ranging from simple widening or thickening of the ligament to granuloma or cyst.

The increased space of the periodontal ligament in this area is due to resorption of the surrounding bony trabeculae with secondary fusion of the connective tissue of the periodontal ligament with the inter trabecular connective tissue of the medullary spaces. The fibers of the periodontal ligament, which become disordered and dysfunctional, lose their insertions in the surrounding bone. However, their insertions in the cementum, particularly in the periphery of the lesion, are preserved. The pathological entity commonly known as a granuloma develops in this way. Sometimes, the inflammatory process also involves other cellular elements within the periodontal ligament, namely epithelial rests of Malassez, which, when stimulated to proliferate, give rise to a cavity and a radicular cyst.

In its various clinical manifestations, chronic apical periodontitis is generally asymptomatic. It is usually discovered on routine radiographic checkups, which on occasion is prompted by suspicious discol-oration of the dental crown. The patient may relate a history of acute (pulpitic) pain that spontaneously res-olved or a history of trauma, but he may also present with a completely unrevealing history. Sometimes, a fistula may be present, through which the patient reports having noticed an intermittent discharge of pus (Figs. 1a–f).
The fistula provides a means of continuous drainage of the lesion. This usually prevents reactivations, either spontaneous or consequent to intervention.

Some authors2,6,10,12,22 are still convinced that the presence of a fistula indicates a more serious lesion that requires special intervention, such as surgical incision and excision of the entire fistulous tract, in addition to extraction of the diseased tooth (Fig. 2).

In fact, the presence of a fistula should be seen as a favorable sign, since it is associated with a number of advantages, so much so that some authors3,8,15,23,24,26,31,32 suggest that if there is none, one should be created.

It may be extremely helpful in diagnosis. Opacification of the fistulous tract by the insertion of a gutta-percha cone clearly demonstrates the diseased tooth 16 (Figs. 3a–d). The opening of the fistula may be found on the mucosa overlying the tooth that sustains it, but it may also often be found at a considerable distance from the diseased tooth (Figs. 4a–f). Indeed, it may cross the midline, as in cases described by Feiglin9 and Kaufmann.16

In other situations, the fistula may run in the space of the periodontal ligament of the same tooth (Fig. 5). It may even traverse the periodontal ligament of the adjacent healthy tooth,17 thus simulating a lesion of periodontal origin (Figs. 6a–d). In such cases, negative pulp tests performed on the crown of the tooth indicated by the gutta-percha cone inserted into the fistula assist in making the correct diagnosis.

Furthermore, healing of the lesion about one week after cleaning and shaping of the infected root canals without the use of any medications within the canal (Figs. 7a–c) confirms that the diagnosis was correct and testifies to the efficacy of the treatment. This also suggests a favorable prognosis for the lesion.
Finally, as already suggested, the fistula provides a means of continuous drainage of the suppurative contents of the peripical lesion. This discourages sudden reactivations, either spontaneous or as a result of our intervention.

If the drainage is not continuous, but rather intermittent, it is preceded by slight swelling of the area as a result of the increased pressure of pus behind the closed orifice. When this pressure is great enough to rupture the thin wall of soft tissue, the suppurative material issues externally through the small opening of the fistulous orifice. This orifice may heal and re-close, only to reopen later. The discharge of pus is never accompanied by intense pain. At most, the patient will complain of slight soreness in that area prior to reopening of the external orifice.

The pus creates a tract in the surrounding tissues, following the *loci minoris resistentiae*. It may exit at any point of the oral mucosa or even the skin. It is not uncommon, particularly in young patients, to find cutaneous fistulae at the level of the mental symphysis, if lower incisors are involved (Figs. 8a–e), or in the submandibular region, if a lower first molar is involved (Figs. 9a–e), or in the floor of the nasal fossa,
if a central incisor is involved.\textsuperscript{13,30}

Cutaneous fistulae, which unfortunately are sometimes treated as though they were independent dermatologic lesions, have the same pathogenic and prognostic significance as mucosal fistulae and require the same therapy.\textsuperscript{21,33} A review of the literature\textsuperscript{5,7,18,29} reveals that patients with cutaneous fistulae are sometimes subjected to repeated surgical excisions and biopsies (Fig. 2d) before it is clear that the fistula is none other than an extension of pulp disease in the periradicular tissues.

Trying to treat such lesions with a circular incision of the orifice of the cutaneous fistula and excision of its entire tract, with all the ramifications — particularly esthetic — of such an intervention, is not consistent with the present standard of care and can be considered pure folly.

These fistulae simply require identification of the diseased tooth, whose root canal system must be cleaned and shaped.

If the tooth presents any obstacles to nonsurgical treatment or retreatment, or if the patient specifically requests surgery, one may proceed surgically, but one’s attention must be directed solely to achieving a retrograde apical seal, and not eliminating the fistulous tract or its cutaneous orifice (Figs. 8a–e). The reason why some authors believe in the need for surgical removal of the fistulous tract lies in the
mistaken conviction that it is lined by an epithelium. Grossman states, however, that such tracts are lined by granulation tissue: in his study, he was unable to identify any epithelium at all.

Fig. 4a. This young patient presented with a fistula between the canine and lower right first premolar. A gutta-percha cone has been inserted into the fistulous tract.

Fig. 4b. Radiographically, the gutta-percha cone seems to implicate the lateral incisor as the diseased tooth. All the teeth heretofore identified have responded positively to the vitality tests.

Fig. 4c. Deeper insertion of the gutta-percha cone finally identifies the two lower central incisors as the diseased teeth. Both respond negatively to the various vitality tests.

Fig. 4d. One week after cleaning and shaping, the fistula has closed.

Fig. 4e. Postoperative radiograph.

Fig. 4f. Two-year recall.

Fig. 5. Preoperative radiograph of a necrotic lower left second premolar with a fistula opening into the space of the periodontal ligament. A gutta-percha cone has been inserted into the fistula.

Fig. 6a. The periodontal probe disappears in the sulcus of the canine in a patient with good oral hygiene and healthy periodontium in the different quadrants. The canine responds positively to the tests of vitality, while the lateral incisor is necrotic.

Fig. 6b. Preoperative radiograph of the lateral incisor. Note that the lesion “rests” on the mesial side of the root of the adjacent canine.
Bender and Seltzer have also made histologic studies of numerous fistulous tracts without finding an epithelial lining.

Other authors agree that the fistulous tract may be lined by flat, multilayered epithelial cells, but that more often it is lined by granulation tissue, with acute and chronic inflammatory cells.

Given the current state of knowledge, there is no reason to recommend surgical removal of such tracts. There is no reason that even epithelium-lined fistulous tracts should not heal after appropriate endodontic therapy.

When it is present, the epithelium may arise from the oral mucosa or proliferating epithelial cells from the periapical lesion. However, there is no correlation between the presence or absence of an epithelium and the clinical appearance of the fistula or its chronicity.

In animal experiments, Ordman and Gillman have demonstrated that cutaneous sutures may become completely epithelialized if the sutures are left in place for several weeks. Once they are removed, however, the epithelium-lined tract always heals completely.

There is no reason that the same should not happen to the possibly present epithelium of the fistula of a necrotic tooth once the inflammatory stimulus is removed.

Obviously, these fistulae must be distinguished from congenital fistulae of the neck, both lateral (arising from the second branchial cleft) and medial.
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(arising from rests of the thyroglossal duct), which are lined by an epithelium. Such fistulae, however, have a different pathogenesis and obviously do not resolve spontaneously, but only after careful surgical excision of the entire tract.\textsuperscript{27} The differential diagnosis includes the following:\textsuperscript{1,21}

- localized infections of the skin, such as pyoderma, pimples, ingrown hairs, and obstructed sweat glands.
- traumatic or iatrogenic lesions.
- osteomyelitis.
- neoplasia.
- tuberculosis.
- actinomycosis.

Conclusion

Endodontic lesions with a fistulous tract should always be welcome in our office. And this is true for many reasons:

- The tooth responsible is necrotic, therefore the patient does not need any anesthesia, which means that while we make the access cavity, at the same time we perform the most important and the most reliable vitality test, the cavity test.
- The insertion of a gutta-percha cone in the fistulous tract will help in the diagnosis: the radiograph will immediately show the tooth responsible.
- The patient will never have a flare up. The re-crudescence after treatment or retreatment is nothing more than one little drop of pus coming out from the fistula, and the patient is not even aware of it.
- One week after cleaning and shaping of the root canal system, the fistula is gone, and this will confirm that we made the right diagnosis and the right treatment.

The presence of a fistula, in conclusion, is not an indication for extraction, is not an indication for surgery, is not an indication for any specific medication: it is just an indication for a correct root canal treatment.

References:


Fig. 9a. Cutaneous fistula in the right submandibular region.
Fig. 9b. Preoperative radiograph of the ipsilateral lower first molar. The tooth had been "opened" one month before and left open "to drain." Note the small radiopacity at the center of the access cavity, due to a residuum of the chamber roof left in place.
Fig. 9c. Clinical appearance of the access cavity: three openings have been made in the roof of the pulp chamber! One, corresponding to the distal canal, is shaped like a figure 8. The two round ones correspond to the mesial canals. The pulp horns have been misdiagnosed for canal orifices.
Fig. 9d. Postoperative radiograph. The tooth has been pretreated with a cooper band.
Fig. 9e. Healing of the fistulous tract two years later. Note the complete absence of any scarring.
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