Periodontal Pocket: An Ecologic Niche Promoting the Germination of a Plant Seed

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During a scaling and root planing procedure, a large, actively germinating seed was removed from a deep periodontal pocket. The histologic examination confirmed that it was a germinating tomato seed (Solanum lycopersicum). Since all seeds inside their fruits are in a quiescent stage, this seed was quiescent when the patient ate the tomato. Therefore, the germination occurred inside the periodontal pocket. This case led to a very interesting biologic finding: A periodontal pocket is not only a favorable environment for the development of periodontal microbiota, it is also an ecologic niche that can promote the germination and development of a plant seed. 


Odontogenic abscesses include a large group of acute infections originating from the tooth and/or periodontium. These lesions are associated with several symptoms, including suppuration in the periodontal tissues associated with swelling, pain, and sometimes with fistula. A classification of periodontal abscesses was proposed by Meng in 1999: (1) gingival abscesses due to a foreign body impaction in healthy sites; (2) periodontal abscesses in relation to pockets; and (3) pericoronal abscesses in the presence of incompletely erupted teeth (pseudopockets).

An interesting classification of periodontal abscesses was reported by Herrera et al in 2015, in which two types of periodontal abscesses were identified: those related to and not related to periodontitis.

“Are they blood stains, or mud stains, or rust stains, or fruit stains, or what are they? That is a question which has puzzled many an expert, and why? Because there was no reliable test. Now we have the Sherlock Holmes test, and there will no longer be any difficulty.”

A Study in Scarlet,
Sir Arthur Conan Doyle (1887)
Periodontitis-related abscesses represent an active periodontal breakdown, with extension of the infection into deepened periodontal pockets without any external influence. This lesion may occur in the untreated periodontal patient or as a recurrent infection during supporting periodontal therapy. Non-periodontitis-related abscesses may occur in relation to a periodontal pocket due to the presence of root morphologic/iatrogenic alterations or impaction of foreign bodies. Foreign bodies include several materials, such as retained pieces of dental floss, fingernail fragments embedded in a pseudopocket, orthodontic elastic to close a diastema, and amalgam tattoo. A thorough history may establish an etiology and time frame in which the foreign body was embedded in the soft tissues, and radiographic examination may useful for the identification of the foreign body. The entity of periodontal breakdown depends on the length of the time during which the foreign body was present in the pocket. Therapy includes management of the acute lesion, removal of the foreign body, and treatment of the residual periodontal lesion.

The unusual case of a foreign body embedded in a periodontal pocket, reported herein, led to an important and unique biologic experience.

Materials and Methods

A 52-year-old woman suffering from chronic periodontitis presented to a periodontal private practice complaining of constant and annoying pain for 1 month in a periodontal pocket at the mandibular left canine. The clinical examination showed the presence of shallow/moderate...
pockets associated with plaque accumulation in the mandibular arch. However, an acute periodontal abscess was present on the left mandibular canine, with bleeding, suppuration, and edema associated with pain (Fig 1). The periodontist (G.P.P.) decided to treat the lesion immediately, and after administering local anesthesia, scaling and root planing of the tooth and pocket debriding were performed. During the procedure, a large, round lump emerged from the pocket; its yellowish color led to the suspicion that it could be a plant seed (Fig 2a). The patient was asked if she could remember eating a fruit or tomato before noticing the problem. She did not provide any useful information regarding her history. Ibuprofen (600 mg/day) was prescribed for 1 week, and she was given appropriate toothbrushing instructions.

Intrigued by this finding and mainly by the seed’s size (weight: 3.1 grams; length: 3.5 mm; Fig 2b), the surgeon (G.P.P.) sent it to the Director (N.P.) of the Istituto Stomatologico laboratory in Pistoia, Italy, for histologic examination. The findings were forwarded to the executive technician (M.T.) of the Tropical Herbarium (Erbario Tropicale) of the University of Florence for biologic assessment, who was asked to identify the species, identify its developmental stage, and confirm whether the seed germinated in the periodontal pocket.

After 4 days, the patient reported improved conditions of the abscess with decreased inflammation; pain had almost disappeared. After 8 days, inflammation, swelling, and pain had disappeared with a marked reduction in probing depth. After 2 weeks, the treated area was healthy and showed a further reduction in probing depth (3 mm). Then the patient underwent a complete periodontal treatment plan.

Results
The Seed Species
The morphologic features (size, round shape, yellowish color of the seed; Fig 2) and the histologic diagnosis (presence of two cotyledons, storage parenchyma cells, an integumental apparatus with external filaments) confirmed that the seed belonged to a dicotyledon angiosperm, and specifically a tomato (Solanum lycopersicum) of the Solanaceae family.

The Seed’s Developmental Stage
The histologic examination showed that the tomato seed was germinating (Figs 3 and 4). Examining the histologic sections from inside-out made it possible to identify two central cotyledons, the radicle
emerging from the integuments, the consumed and degraded endosperm, and the integument covered with fine hairs. Figure 5 shows the developing radicle with meristematic cells filled with glycogen during the first phase of germination.

**Could the Seed Have Germinated in the Periodontal Pocket?**

Quiescence is regulated by the water-impermeable integument that is resistant to embryonic expansion by the presence of immature embryos and by the presence of chemical substances such as ammonia, ethylene, abscisic acid, alkaloids, hydrocyanic, and parasorbic acids that impede germination. A quiescent seed (Fig 6) is highly dehydrated (5% to 15% water) and consists of two dicotyledons bound to the central portion by the hypocotyls, a central axile portion with one end of the sprout (seedling) and the root apical meristem; a central part containing reserves (starch, cellulose, proteins, phytin); and a thick and membranous external layer (integument).

**Germination**

A seed can germinate outside of the fruit if it finds suitable environmental conditions. Germination occurs if the seed’s environment is able to eliminate the factors regulating quiescence. A slightly acidic pH that deteriorates the integument, temperatures above 10°C, and the presence of water that washes away the integument inhibitors induce the imbibition by the quiescent seed. The presence or absence of light is not a determining factor. The oxidative processes necessary for germination can begin under these conditions. The first sign of germination is the consumption of the reserve substances and the emergence of the radicle. This process occurs in a few hours when forcing a culture and within 7 to 10 days under natural conditions. The developing radicle emerges from the integument and becomes the primary root; the aerial part of the plant will only emerge after this.

On the basis of this information, the expert (M.T.) confirmed that the tomato seed removed from the periodontal pocket with the radicle that had emerged from integument and the consumption of the storage...
parenchyma cells was actively germinating (Figs 3 and 4).

Discussion

Odontogenic abscesses include a large group of acute infections originating from the tooth and/or periodontium. This case report shows that the periodontal abscess was caused by a foreign body, specifically a plant seed that had been inside a periodontal pocket for an extended period of time. The unique nature of the foreign body and the long time it had remained in the pocket led to some interesting considerations.

The periodontal pocket is a biologic space that benefits the development and spread of Gram-negative periodontopathogenic germs.\(^1\) The pH of 7.0 to 8.5\(^1\); the moisture due to crevicular fluid and the presence of blood; as well as the mean temperature of the area of 35ºC, ranging from 30ºC to 38ºC\(^1\); the mean temperature of the area of the presence of blood; as well as the moisture due to crevicular fluid and due to the rinsing effect of the crevicular fluid that removed the inhibitory enzymes, the acid environment, and a temperature of approximately 37ºC (higher than the 10ºC needed for germination), the seed found an extremely positive environment to begin germinating. Furthermore, the well-developed radicle that had emerged from the integument and the consumption of the endosperm show that the tomato seed was in an advanced stage of germination.

Conclusions

The histologic examination made it possible to identify the lump removed from a periodontal pocket as an actively germinating tomato seed (Solanum lycopersicum). Germination occurred inside the pocket because the seed in the tomato that the patient ate was in the quiescent stage when it entered the pocket. This very unusual case led to an interesting biologic conclusion. A periodontal pocket is not only a favorable environment for the development of periodontal microbiota, it is also an ecologic niche that can host the germination and development of a plant seed.

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References