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Perspective

True cyst: An unsolved truth

Yi-Chieh Lee [a†], Chung-I Chang [b†], Hsin-Hui Wang [b*]

[a] Department of Dentistry, Wan-Fang Hospital, Taipei Medical University, Taipei, Taiwan
[b] Division of Endodontics, Department of Dentistry, Wan-Fang Hospital, Taipei Medical University, Taipei, Taiwan

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Nowadays, most of the clinicians reach a consensus that periapical lesions cannot be differentially diagnosed into cystic or non-cystic lesions on the basis of radiographic examination alone, even though large lesions are more likely to be cysts. Cysts were characterized into true cysts and pocket cysts depended on whether the lumen of the cyst cavity communicates directly with the root canal system through the apical foramen or not.[1–3] Although both true cysts and pocket cysts are caused by root canal infection, most oral surgeons and endodontists believed that true cysts do not heal and have to be surgically removed. However, is it true that true cysts don't heal after nonsurgical root canal treatment?

After root canal infection, periradicular tissues initiate an immune reaction that may end up to bone resorption and granuloma formation, and the formation of apical cysts is related to proliferation of epithelial cell rests of Malassez caused by inflammatory mediators, proinflammatory cytokines, and growth factors released from host cells.[2,4] As time passes, the lesion may become epithelialized and ultimately formed a cavity lined by epithelium, which characterizes apical cysts.[2] Once root canal infection is effectively eliminated, apical cysts may be able to regress after nonsurgical root canal treatment by the mechanism of apoptosis.[4] An interesting hypothesis about the nature of epithelium was raised by Huang.[5] From his point of view, epithelial cells are tended to form a layer of epithelium just to separate the infected materials from normal tissues.[5] It seems that infected root canal systems are considered as contaminated parts, and therefore epithelial cells wrap up the apical foramen to form a pocket cyst.[5] The process looks like a defense mechanism to push the infected tooth outside from the body as a foreign substance. Based on this hypothesis, it is possible that once the epithelial cell layer eventually enclosed the abscess or foreign substance completely, thus forming a true cyst.

According to the work made by Nair et al., in 1996, periapical cysts account for 15% of all human periapical

* Corresponding author. Division of Endodontics, Department of Dentistry, Wan-Fang Hospital, Taipei Medical University, No. 111, Sec. 3, Xinglong Rd., Wenshan Dist., Taipei 116081, Taiwan.
E-mail address: juri_bb@yahoo.com.tw (H.-H. Wang).
† These two authors contributed equally to this work.

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lesions. Among all periapical cysts, 9 of 15% are true cysts; 6 of 15% are pocket cysts.[1] The only reliable way to distinguish true and pocket cysts is through serial sectioning or step-serial sectioning of the lesions removed in toto.[1,2] The authors addressed that the inaccurate histopathologic diagnosis in the early researches led to the higher incidence of radicular cysts, and this methodological error resulted in an illusion that most cystic lesions at periapex heal after nonsurgical root canal treatment.[1] In the conclusion, they claimed that true cysts may be less likely to be resolved by nonsurgical root canal treatment due to the self-sustaining nature and have to be surgically removed.[1] However, this speculation was based on one single case report, and the axial sections passing through the apical foramen was not able to be obtained from the specimen as an accurate histopathologic diagnosis requires.[6]

During our training in endodontics, we learn that the etiologies of endodontic posttreatment diseases is persistent or reintroduced intraradicular microorganism, extraradicular infection, foreign body reaction, and true cysts.[7] It was believed that true cysts can only be treated by apical surgery due to no communication between the cyst lumen and root canal.[1] So far this concept is still a guideline that can never be negotiable to many practitioners. Since a true cyst is similar to a pocket cyst not only in pathogenesis but also in histology and molecular cell biology, it is possible that true cysts may regress in the same way, and no sufficient scientific evidence proved that the cause of those teeth undergoing apical surgery were purely due to true cysts.[8,9]

When it comes to the outcome of nonsurgical root canal treatment, a study using logistic regression analysis showed that the success rate of root canal treatment performed by a specialist in his private clinic was 85.4%.[10] According to the study by Friedman et al., in 2004, the survival rate of teeth with apical periodontitis completely healed after initial treatment or retreatment is 74%—86%, and their survival rate over time is 91%—97%.[9] It seems that those teeth which cannot heal well usually have their "issues", including missing canal, anatomical complexity, nonstandard root canal treatment procedure, coronal leakage, iatrogenic problems, apical calculus, cracks, etc., and the presence of a true cyst is usually not the biggest issue to discuss in most of the articles related to endodontic failure. Excluding those possible etiology associated with infection, the prevalence of true cysts is not corresponding to the failure rate of nonsurgical root canal treatment. The possibility that true cysts can be treated by nonsurgical root canal treatment is undeniable.

Whether true cysts heal after nonsurgical root canal treatment or not is still a huge controversy.[2] So far there are no good methods to identify if the cyst is "true" or "pocket" without surgical intervention.[3] Although few papers mentioned the possibility of using polyacrylamide gel electrophoresis of the periapical fluid, tomography and ultrasound real-time imaging, the only reliable way to distinguish true and pocket cysts is through serial sectioning or step-serial sectioning of the lesions removed in toto.[1,2] Therefore, it is hard to prove that true cysts could be resolved by nonsurgical root canal treatment alone. However, the indirect evidence given by recent literatures tell us: the formation of true cysts is not due to neoplastic transformation; instead, the two types of cysts were always associated with infection, so it may not be appropriate to describe true cysts as self-sustaining.[2,4,5] In clinical reality, we still need to arrange proper recall schedule for patients to evaluate the necessity of apical surgery since we don't have reliable diagnostic tool to early predict the formation of true cysts. Although it seems meaningless to differentiate true cysts and pocket cysts in clinical situation, more studies are still necessary for understanding the pathobiology of apical cysts and the relation between true and pocket cysts. If true cyst is a late stage of a pocket cyst due to continuous proliferation of epithelial cells, prevention of the disease by early detection and intervention will be our target to solve these stubborn cases.

Declaration of competing interest

The authors have no conflicts of interest relevant to this article.

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