

Evaluating the Outcome of Endodontic Treatment

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The primary goal of root canal treatment is to achieve the highest possible long-term levels of comfort, function, and aesthetics in the endodontically treated teeth. These goals can be achieved by eliminating or significantly reducing pathogenic bacteria and preventing recontamination, starting from correct root canal instrumentation, irrigation and sealing, and by avoiding iatrogenic errors.¹⁻³ Three-dimensional hermetic obturation of the root canal system is then needed to eliminate a habitat for bacteria and prevent reinfection of the endodontic space. Finally, leak-resistant restorations prevent bacterial recontamination and achieve functional and esthetic rehabilitation of the endodontically treated teeth.⁴

Optimal outcomes are dependent on how well clinical procedures are performed. Because of the complexity of root canal systems, less than perfect instrumentation, irrigation, and obturation procedure, significant elimination of bacteria from the root canal systems cannot be achieved in some cases. In most cases, however, a clinically relevant reduction of the bacterial infection is obtained, allowing proper healing.⁵⁻⁷

Success can be defined in different ways depending on the initial clinical situation: in vital pulp cases, without a preexisting periapical lesion, a positive outcome means that the tooth remains asymptomatic and a periapical lesion does not appear in control radiographs. In teeth with a previously necrotic pulp, the endodontic therapy is considered successful, when the tooth remains or becomes asymptomatic, when a preexisting periapical lesion heals, and no new apical lesion develops. Clinical criteria for success generally include the absence of swelling and other signs of infection and inflammation, disappearance of sinus tract or narrow, isolated probing defect, no evidence of soft tissue destruction, including probing defects, and the tooth should be restored and in function.^{8,9}

The American Association of Endodontists has proposed the following terms as an alternative to the terms “success” and “failure”:

- Healed—Functional, asymptomatic teeth with no or minimal radiographic signs of periradicular lesions
- Nonhealed—Nonfunctional, symptomatic teeth with or without radiographic signs periradicular lesions
- Healing—Teeth with periradicular lesions that are asymptomatic and functional, or teeth with or without radiographic periradicular lesions that are symptomatic but for which the intended function is not altered
- Functional—A treated tooth or root that is serving its intended purpose in the dentition

Because the path to bony periradicular healing may be long and irregular, determination of success or failures is not always a well-defined process. Many asymptomatic endodontically treated teeth have varying degrees of radiolucency. Moreover, two-dimensional images not always show small periapical lesions.¹⁰ The dentist must

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judge whether these teeth are in progress to success or to failure and then advise the patient and manage the teeth appropriately.

Recommended follow-up periods have ranged from 6 months to 5 years. Six months is a widely accepted and reasonable interval for a recall evaluation for most patients, since bone healing takes time to develop and be visualized in radiographs. It is difficult to determine at what point it is likely that a treatment outcome will not change. In other words, there is not a precise indication when can it be determined that treatment has either succeeded or failed, and the outcome is unlikely to change, so that no further recall is necessary. A radiographic lesion that is unchanged or has increased in size after 1 year is unlikely to ever resolve; therefore, the treatment may be unsuccessful. If at 6 months the lesion is still present but smaller, it is likely to be in progress to healing, and additional recall is needed. Usually, it takes longer for larger periradicular lesions to heal than smaller lesions.^{11,12} Unfortunately, apparent success may revert to failure later (often as a result of reinfection through coronal leakage). Late healing may also occur. Therefore, a detailed evaluation over time of the endodontically treated teeth, including patient history, the various clinical examinations, and radiographs during follow-up visits, should be programmed and performed.

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