Endodontic retreatment
Achieving success the second time around

Dr Brett E. Gilbert
USA

Root-canal treatment has been shown to have a success rate of 90%. However, as research methodologies move towards higher levels of substantiation, clinicians must rely on the best current evidence available to gain insight into the expected outcomes of their treatment. The highest level and best current evidence we have on the clinical success of endodontic treatment comes from a meta-analysis of the literature.

A meta-analysis done in 2007 by Ng et al. provided a thorough review of endodontic success rates from a variety of classical outcome studies. They found a weighted pooled success rate of 68 to 85%, with at least one year of follow-up. This review considered the strictest of criteria for determining that a tooth has healed, and included many studies that were completed prior to the clinical use of dental operating microscopes and other advanced armamentaria.

When considering treatment for a tooth that has not healed successfully with root-canal therapy, there are significant challenges to address to be able to attain complete healing of the diseased tooth. The armamentarium and techniques available today allow us the ability to disinfect the root-canal system properly after initial treatment has led to post-treatment disease.

The success rate of retreatment has been shown to be in the range of 80%; healing. Phases III and IV of the Toronto Study showed such an healing rate four to six years of the Toronto Study showed such a healing rate four to six years. Phases III and IV of the Toronto Study showed such a healing rate four to six years.

The bacteria present in the initial infection of a root canal differ markedly from the bacteria infecting a previously treated tooth. Post-treatment flora is polymicrobial with equal numbers of Gram-negative and -positive bacteria. Post-treatment bacteria are predominately Gram-positive and have been shown to be able to survive in harsh environments and to be resistant to many treatment methods.

There are high numbers of Enterococcus species, for example, has been shown to be a common isolate in 27 to 77% of teeth with post-treatment disease. A contaminated canal space may result from incomplete cleansing initially or subsequent leakage into root-canal spaces following root-canal treatment. Once present inside the canals, E. faecalis has a variety of characteristics that allow it to evade our best efforts to eradicate it from the root-canal system, including the ability to invade dental tubules and adhere to collagen. It is also resistant to calcium hydroxide ap- plication inside the canal system, which is an inter-appointment treatment technique used to help remove micro-organisms and their by-products, such as lipopolysaccharides, from the canal space.

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with irritants and medicaments, and allows communication between bacteria to aid in survival capabilities. The presence of E. faecalis is well documented; however, its role in post-treatment disease has yet to be proven definitively. Its survival mechanisms, however, shine a light on the persistent capabilities of these bacteria, and our clinical techniques must be focused on the challenge of eliminating them.

Iatrogenic issues encountered during the initial root-canal treatment may be the cause of intra-canonical bacterial infection. These issues may include perforation, incomplete-cleansing and shaping, inadequate canal enlargement, missed canals, ledgeing, canal transportations, over-storing, over-instrumentation, as well as obstruction of the canal by debris or separation of instruments. Failure to use or using too small a volume of an appropriate irrigant solution, such as sodium hypochlorite, is an iatrogenic error.

Failure to place an effective permanent access restoration in a timely manner can allow for bacterial entry into the root-canal system by coronal leakage. Submarginal leakage on a crowned tooth can also allow bacterial entry to occur.

Decay in a previously treated tooth is another source of bacterial contamination. Structural damage to a tooth by trauma, cracking or fracture may provide an entry point for bacterial contamination of the canals. Our patients are responsible for their own oral health and must commit to effective oral hygiene techniques. Failure of the patient to perform effective oral hygiene can result in the failure of even the most well executed root canal and restorative treatments.

With the bacterial challenges clinicians have to face, retreatment techniques must be capable of effective elimination of bacteria and their substrates. The use of a dental operating microscope and ultrasonic instruments allows clinicians to uncover all existing canal anatomy properly to ensure that they are able to cleanse the root-canal system completely. The following clinical case (Figs. 6a–c) illustrates the extent of the canal space left untreated in the initial root-canal therapy by not opening the mesiobuccal canal adequately and not locating and cleansing the hidden second mesiobuccal canal.

Endodontic ultrasonic tips are highly efficient at removing core build-up material, paste fills, posts and silver point fillings, as demonstrated in Figure 5. These instruments allow clinicians to conserve root dentine by providing excellent visibility under a dental operating microscope, thereby greatly improving the ability to retreat canals (Figs. 6a–c). A heat source such as a System B tip (Axis, SironaEndo) is efficient for the removal of gutta-percha and resin materials from the coronal third. Hand and rotary files can remove root fillings and shape canals to appropriate working lengths. Current NiTi rotary files are highly flexible and resistant to separation and allow us to mechanically enlarge the apical third of root canals safely and efficiently without alteration of the natural canal morphology, which allows effective irrigation to reach the complex apical root-canal anatomy where bacteria are able to hide and resist debridement.

Once the canals have been located and instrumented, the ability to irrigate becomes essential to successful treatment. The irrigant solutions target the bacteria we are trying to eliminate. While sodium hypochlorite is a potent and proven antimicrobial and tissue dissolver,27,28 2% chlorhexidine has been shown to prevent the adherence of E. faecalis to dentine.29 EDTA 17 % is often used as a drug to remove cemental or sealer remnants.29 Therefore, mechanical debridement and canal instrumentation provide a pathway for corrosive chemical irrigation deep into the canal.

Passive ultrasonic irrigation allows clinicians to place an irrigant solution into the pulp chamber and activate it as it is carried down to the root apex. The Irrisafe tip from Satelec (Acteon, IrriSafe tip from Satelec. (Courtesy of Acteon Group, France)—Fig. 7a. Tooth #30 with silver-point fillings in the mesial root and a post in the distal root. The mesial root-canal preparations are transported towards the mesial. There is a radiopaque periapical lesion.—Fig. 7b. Post-op radiograph.—Fig. 7c. Fifteen-month follow-up. (Courtesy of Dr Brett E. Gilbert)