

## Success and Failure in Endodontics

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### Abstract

The criteria for considering a root canal treatment as success or failure many. Just because the clinical symptoms have subsided that doesn't mean that the treatment is success, its just the severity of the disease has come down. The clinical, radiographic as well as the time factor after the treatment should be considered in the progress of the treatment. This article highlights the cause of success and failure of endodontics.

**Keywords:** Endodontics; Failure; LASERS; Success; Surgery.

### Introduction

Endodontic treatment unlike esthetic dentistry, orthodontics or prosthodontics needs removal of the existing disease. The tooth anatomy can vary with race, age and gender. The cause of the disease can be carious or non carious like trauma. It can also be previous endodontic treatment that has failed. Proper diagnosis of the case will help in better treatment and eventually help in complete removal of the disease. The failure of initial treatment can be various including missed canals, inadequate enlargement and incomplete obturation. Now the real challenge is to remove the disease and ensure that the case doesn't fail for the second time. The astute clinician must diagnose properly using latest imaging techniques and use latest canal disinfection techniques based on evidence to ensure the success [1,2].

### Criteria for a Failed Endodontic Treatment [3]

Most common cause of failure of endodontic treatment is residual infection within the root canal system. It might remain in uninstrumented surfaces of the root canal, missed canal, apical ramifications

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or periapical biofilms.

1. When the presenting clinical signs like sinus, swelling or the pain does not subside even after 1year
2. The size of the periapical lesion does not come down even after 1 year

The most common causes of endodontic treatment failure include (Thiele et al. 2003):

- Incomplete apical obturation
  - Incomplete coronal obturation
  - Incomplete disinfection of the root canal (extra canals, ramification, aberrant dentin tubes)
  - Precise microbial infection (enterococcus faecalis and candida albicans, for example, are very meagerly susceptible to the effects of calcium hydroxide.)
  - Protracted course of treatment
  - Iatrogenic damage of integrity of the tube's anatomy (excessive instrumentation/over filling/false route)
3. According to Ray and Trope (1995) [4], good apical and coronal closure resulted in 91.4% of cases in complete resolution of the endodontic infection. If only good apical obturation is guaranteed but a tight coronary closure is refrained from, the rate of success is reduced to 44.1%.

### Criteria for A Successful Endodontic Treatment [5]

1. There is no swelling and other sign of infection

and inflammation

2. Complete healing of sinus tract in case it was present before starting the treatment or healing of narrow, isolated probing defect
3. No clinical proof of soft tissue destruction, including probing defects
4. The tooth is back in form and function.

#### **Radiographic Criteria [6,7]**

There is regeneration of periapical bone following endodontic treatment. But this will take time at least 6 months to 1 year depending upon the extent and size of periapical lesion. However, periapical radiographs may not be accurate enough in giving a 3 dimensional picture of the lesion hence CBCT (cone beam computed tomography) or micro computed tomography must be used to get accurate picture of the progress of the bone formation.

Quality of obturation of the root canal achieved with regard to the density, filling material, regularity and anatomical form of the mechanical preparation, degree of enlargement of the root canal and condition of the periapical tissue.

#### **How to Increase the Success Rate [4]**

1. Determine and diagnose the condition accurately
2. Use advances diagnostic techniques like micro CT to know the internal anatomy of the pulp chamber and root canal. Check for extra canals or bifurcations in the apex.
3. Use of rubber dam and other isolation techniques during the treatment phase

As an alternative to the terms "success" and "failure," the American Association of Endodontists has proposed the following terms:

1. Healed – Functional, asymptomatic teeth with no or minimal radiographic periradicular pathosis.
2. Nonhealed – Nonfunctional, symptomatic teeth with or without radiographic periradicular pathosis.
3. Healing – Teeth with periradicular pathosis that are asymptomatic and functional, or teeth with or without radiographic periradicular pathosis that are symptomatic but for which the intended function is not altered.

4. Functional – A treated tooth or root that is serving its intended purpose in the dentition.

#### **Single Visit vs. Multiple Visit Endodontics**

Several studies have proven that the success rate of single visit is equally good as multiple visit endodontics when calcium hydroxide was used as inter-appointment dressing to reduce the intracanal infection [1]. The advantages of single visit treatment includes avoiding microleakage during the inter appointment visits, less flare up and better patient acceptance [2, 8]. Few studies have shown that even though success with single visit treatment is more comparatively the difference in healing rate between these two treatment regimens was not statistically significant [9].

#### **Influence of Calcium Hydroxide Intracanal Dressing**

Studies and meta-analysis of literature has shown that Calcium hydroxide has limited effectiveness in eliminating bacteria from human root canal when assessed by culture techniques [10]. Few other evidence based studies have shown that calcium hydroxide has limited effectiveness in eliminating bacteria from human root canals, when assessed by culture techniques [11]. Also, few studies have refuted the medicinal effects of calcium hydroxide and concluded that calcium hydroxide did not show the expected effect despite following up the case for 1 year in disinfecting the root canal system and treatment outcome despite there were cultivable microorganisms in the canal, and there is a need for better medicament that can be used as intracanal medicine [12,13]. When calcium hydroxide was used in non vital teeth with periapical lesions, it could only limit the microorganisms but not totally eliminate the infection [14].

#### **Surgical vs. Non Surgical Root Canal Treatment**

When conventional orthograde treatment fails with the periapical lesion intact, people resort to apicoectomy before more extensive treatment like extraction. The doctor must diagnose the case properly before taking any step. He should use diagnostic aids like CBCT or micro CT to check for any missed canals which may be the cause for failure of initial treatment. Cases have been reported which have undergone surgery in the past but failed and it was retreated in orthograde way and lesions healed [15,16].

### Use of Ultrasonics, LASERS and Sonics

Several advancements have been made with regard to disinfection of the root canal. WaterLase Er,Cr:YSGG 2,780nm laser energy can penetrate deep into dentinal tubules to culminate bacteria, without any potential toxicity of sodium hypochlorite (NaOCl) irrigating solutions [17].

Research has proven that use of LASERS potentially improved the success rate when compare to cases that were not treated without using them [18].

Photo-activated disinfection (PAD) has also been used in disinfecting root canals. Research has shown that The PAD and EndoActivator system were more successful in reducing the root canal infection than the diode laser and NaOCl syringe irrigation alone [19].

*E. Faecalis* is the most commonly found bacteria in failed root canal treated cases. Studies have not been so conclusive about eliminating this bacterium from root canal. Photodynamic therapy killed *E. Faecalis* in experimental primary endodontic infections and retreated human root canals. PDT is an effective supplement in root canal disinfection; especially in endodontic retreatments [20].

Other studies have shown that efficacy of PDT in eliminating *E. Faecalis* from infected root canals remains questionable [21].

Ultrasonic irrigation of the root canal can be done with or without simultaneous ultrasonic instrumentation. Passive ultrasonic irrigation (PUI) can be used When canal shaping is not being done. PUI is more effective in disinfecting canals than ultrasonic irrigation along with simultaneous ultrasonic instrumentation. But factor like canal shape and diameter, irrigation frequency, intensity on the streaming pattern as well as the complicated interaction of acoustic streaming with the adherent biofilm needs [22].

### Discussion

The root canal anatomy is never standard for a particular tooth. Cause for failure include perforation, overextension of obturating material, violation of the anatomical apex, Studies have shown that the most common microorganism involved in failure is *Candida albicans*, as it has been isolated in the failed cases [3].

With the advent of imaging techniques like cone beam computed tomography, micro CT, the practitioner should be able to better detect

additional canals in case doubt arise [5].

The possibility of periapical surgery must be considered in case there is a frank cystic lesion or multiple failures of the same case [22].

### Conclusion

An astute practitioner must take the aid of the latest technology right from diagnosis through treatment phase to avoid any pitfalls and ensure the best treatment. The treating dentist must diagnose the condition properly particularly while treating retreatment cases, identify the cause of failure, look for any deviation in the root canal anatomy like apical ramifications or additional canals, and ensure that the disease will subside completely both radiographically and clinically.

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