FACTORS DETERMINING ENDODONTIC FAILURES: A REVIEW
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ABSTRACT
In case of vital teeth, the success of endodontic treatment is related to prevention of microorganisms form entering the root canal system and thereby preventing formation of the periapical lesion. While, in relation to non-vital teeth, it is related to elimination or significant reduction of the microorganisms form the root canal system and healing of the associated periradicular lesion. The success and the failure of the endodontic treatment depend on various factors like local, systemic, microbial or iatrogenic. Knowledge and understanding of these factors will help in increasing the chances of success of the endodontic treatment and prevention of the failures. The present article reviews the factors related to the endodontic failures.

Keywords: Endodontic failures, Microorganisms, Root canal treatment.

INTRODUCTION
The basic aim of the root canal treatment is the complete elimination of the infection from the root canal and prevention of the reinfection by sealing of the root canal by obturation¹. For the achievement of success endodontic treatment, cleaning, shaping and filling of the total root canal are considered as the essential steps². When proper endodontic treatment is done, periapical lesion heals and regeneration of the osseous lesion occurs with gradual decrease and resolution of the radiolucency on subsequent radiographic follow-up¹. Failure of the endodontic treatment occurs when the treatment falls short of the acceptable standards and the reason that many teeth do not responds to endodontic treatment is procedural errors which persists endodontic infection³. Endodontic treatment is considered failed if:
1. The treated tooth is symptomatic⁴.
2. Abnormal soft tissue response to manual examination⁴.

Radiographic changes in endodontic treatment failure:
1. Incomplete repair of the periapical lesion⁴.
2. Persistence of the periapical lesion or increase in size of the previous lesion⁴.

Various factors responsible for endodontic failure are:
A. Local factors:
1. Poor debridement: Inadequate debridement of the root canal usually leads to the endodontic treatment failure.

When canals are not debrided properly, the chances of reinfection increases due to continued presence of the bacteria⁴.

2. Broken instruments: Presence of the denticles in the root canal system enhances the chances of the breakage of the endodontic instruments⁴.

3. Anatomical Variations: Presence of anatomical variation like excessively curved canal, excessive root, mineralization, impenetrable accessory canal & canal bifurcation near root open may result in endodontic treatment failures⁴.

4. Excessive hemorrhage: Presence of the small hemorrhages during endodontic treatment is repaired without incident. But, when excessive hemorrhage occur due to extirpation of an inflamed pulp along with instrumentation beyond the apex of the tooth, it usually results in mild inflammation, due to formation of hematoma by local accumulation of blood. In such situations, if the extravagated blood cells and fluids are not resorbed by the macrophages, it leads to delayed repair and also acts as a nidus for the bacterial growth⁴.

5. Mechanical irritants: The irritation of the endodontic over instrumentation also increases the chances of the failure of the endodontic treatment⁴.

6. Chemical irritants: The function of the various medications in the endodontic treatment is to eliminate or reduce the microbial flora, prevent pain, reduce the
inflammation and stimulate the repair. But, no preparation technique can totally eliminate the intracanal irritants and the presence of “critical amount” can sustain periradicular inflammation.

7. Overextended fillings: Acts of pushing dentinal shavings and/or obturating material beyond the apex causes the toxic materials to contact with the periapical tissues, which may cause necrosis of cementum, periodontal ligament, and alveolar bone.

8. Pretreatment lesions: Various previous research and studies suggests that the chances of an endodontic success are lesser in teeth with periapical lesion as compared to a tooth with a vital pulp.

9. Coronal microleakage: It is also a significant factor in the failure of the endodontic treatment.

10. Access preparation: Underextended or malaligned access opening can cause furcation perforation.

11. Mid-treatment flare up: The prompt & effective treatment of mid treatment flare ups of all type is essential & integral part of endodontic therapy. Failure to do mid-treatment may lead to endodontic failure.

12. Improper obturation: Failure of the lateral condensation can lead to endodontic failure.

13. Improper placement of posts: Improper placement of posts & use of the large posts also results in failure.

B. Iatrogenic factors:

The most common causes are the fractures of the steel and nickel-titanium endodontic instruments. Other iatrogenic causes may be the false ways, or the punching of the pulp floor, as a result of the inappropriate use of the dental instruments.

C. Systemic factors:

Several systemic diseases interfere with the regenerative capacity of the bone. Recognition of these conditions is important for the establishment of a correct treatment plan. Moreover, the presence of such diseases may also explain endodontic failures that are beyond the control of the endodontist. These include Paget’s disease, hyperparathyroidism, hyperthyroidism, and osteoporosis. Other factors like age, nutrition, hormones, chronic disease, vitamins, stress and dehydration also affect the periapical repair. The systemic disease may influence local tissue resistance, there by interfering with healing potential.

D. Microbial factors:

The major cause of endodontic failure is the persistence of microorganisms in the apical portion of the endodontically treated tooth. These are polymicrobial in nature and dominated by gram-negative or gram positive anaerobic rods, especially Enterococcus faecalis. The microbial factor includes:

a) Intraradicular infections: Microorganisms colonizing the root canal system play an essential role in the pathogenesis of periradicular lesions.

b) Extraradicular infections: Various studies have shown that the occurrence of extraradicular infections in both treated and untreated root canals.

Since bacteria established in the periradicular tissues are inaccessible to endodontic disinfection procedures, extraradicular infection can be a factor in the failure of endodontic therapy. This microflora may be extremely resistant and difficult to eradicate and thus predisposing to infection and failure of endodontic treatment.

C) Microbial factors in special situations:

In case of improper coronal seal, overfilling or presence of periapical lesion, there are more chances of persistence root canal infection.

CONCLUSION

The key factors in the success of the root canal treatment are: to thoroughly debride the canal system of infected or necrotic pulp tissue and microorganisms. Along with these it is also important to obtain complete seal of the canal space, which prevents the persistence of infection and/or re-infection of the pulp cavity. It is also utmost important that the patient should be clearly informed about all the possible outcomes of the endodontic treatment. Proper treatment protocols along with thorough knowledge and meticulous attention to treatment details are essential to minimize the endodontic treatment failures.

REFERENCES


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