



SINGLE VISIT ROOT CANAL TREATMENT: A REVIEW

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ABSTRACT

The main objective of performing root canal therapy is to eliminate bacteria from the infected root canal system or remove inflamed pulp tissue and close it with a biologically acceptable filling material. If this treatment managed well, regardless of the number of visits, it will create a favorable environment for healing. The recent advances in Endodontic technology, attracts the dental practitioners as well as the Endodontist to perform the root canal treatment in one visit. The question that we consider in this review article focuses on the long term prognosis of one-and multiple appointment endodontic therapy for teeth with vital pulp, necrotic pulp, and apical periodontitis.

INTRODUCTION

In endodontics, with continuously evolving newer technology and data gathered from evidence based research, the art and science of endodontics have taken multiple travelled as well as untraveled roads in their quest for excellence and this may itself have opened new roads to travel.^[1]

In other words, Endodontic success depends upon localization, proper chemo mechanical preparation of the root canal system, debridement, shaping, disinfection, and three dimensional obturation of canal system. To achieve these goals, endodontic therapy used to be performed in multiple visits for complete disinfection of the canals, all together for the better success of endodontic therapy.

Multiple visit endodontics was an established norm in the field of endodontics, but it has certain disadvantages like inter appointment contamination and flare ups caused by leakage or loss of temporary seal, prolonged time taken leading to patient fatigue, operator fatigue, inability to provide esthetic restorations in time in case of traumatically damaged crowns and discontinued treatment leading to failures.^[2]

All these factors led to the shift in endodontic therapy from multiple visits to single visit endodontic therapy which is a conservative, non surgical treatment of an endodontically involved tooth consisting of complete chemo-mechanical preparation and obturation of the root canal system in a single visit.^[3]

Retrospective analysis suggests that single visit endodontics is a natural corollary to the transformation in the treatment modality of endodontic therapy to an era of rotary endodontics from an earlier era which consisted of hand held files. With research studies, the field of intra canal preparation, culturing, root canal filling materials and techniques has lead to complete alteration in the concept of endodontic practice. Because of the ever expanding newer materials and an increasing number of favorable clinical research studies and clinicians ability to perform more accurate endodontic procedures using dental operative microscopes which greatly increases the visualization of the area of interest, enhanced imaging techniques using digital radiography, precise apical foramen detection using modern electronic apex locators, and root canal cleaning and shaping with more refined method of using rotary driven NiTi files used with computer assisted electronic hand pieces, ultrasonics, all for the sake of achieving an optimal result during endodontic treatment ultimately adding to above concept of "Maximum dentistry in Minimum visits" in the present scenario. As time factor is probably one of the more important factor it is possible to use single visit endodontics as the most accepted technique among the patients and operators.

Single visit root canal treatment versus the multiple visit root canal treatment has been the subject of a long standing debate within the dental community. Some of the unresolved issues include differences in clinical outcomes, inadequate microbial control and pain. The air around the controversy can be investigated more systematically with the aid of an evidence based

approach. When the clinicians are faced with choices of which treatment should be offered to patients, the central issues that should be considered are effectiveness, complication, cost and probably patient /operator satisfaction.^[4]

So with recent advances single visit endodontics has been shown to be an effective treatment modality when compared with multiple visit therapy and it does not deviate from achieving the objectives of proper biomechanical preparation, debridement, shaping, disinfection and 3 dimensional obturation of root canal system and is more beneficial to the patient and dentist provided there is careful case selection and strict follow of standard endodontic protocols.

Indications for single visit endodontics are

- Patients requiring full mouth rehabilitation.^[1-4]
- Physically disabled patients who cannot come to dental clinics frequently.
- Uncomplicated vital teeth.
- Patients in whom sedation is required.
- Fractured anterior or bicuspid teeth where esthetics is the concern.
- Teeth with accidental/mechanical pulp exposure.
- Intentional root canal therapy.
- Vital pulp exposures due to caries or trauma with symptomatic pulpitis.
- Teeth requiring immediate post placement, where esthetics is the concern.
- Teeth with sub-gingival breakdown, multiple coronal walls missing, where isolation and sealing is the problem.
- Non vital teeth with sinus tract.
- Some of the re-treatment cases.

Contraindications for single visit endodontics are

Patients having severe pain on percussion suffering from acute apical periodontitis.^[1-3]

- Teeth with anatomic anomalies for e.g. calcified and curved canals.
- Patients with allergies.
- Acute alveolar abscess cases with pus discharge.
- Patients who are unable to keep mouth open for long duration for e.g. TMJ disorders.
- Teeth with limited access.
- Symptomatic non vital teeth and no sinus tract.
- Asymptomatic non vital teeth with periapical pathology and no sinus tract.
- For most of the re-treatment cases.

Treatment protocol differences between single and multiple-visit

A major goal of root canal treatment is the prevention or treatment of apical periodontitis, leading to the preservation of natural teeth. The presence of bacteria inside the root canal system results in the development of periapical lesions.^[1]

Traditionally, root canal treatment was performed in multiple visits, with the use of extra disinfecting agents (intracanal dressing) besides the irrigants that is used during the cleaning and shaping procedure which mainly aims to reduce or eliminate microorganisms and their by-products from the root canal system before obturation.

The most intracanal dressing researched and widely used is the calcium hydroxide ($\text{Ca}(\text{OH})_2$) paste.^[3] Calcium hydroxide a strong alkaline substance, which has a pH of approximately 12.5. In an aqueous solution, $\text{Ca}(\text{OH})_2$ dissociates into calcium and hydroxide ions. The hydroxyl ion OH^- is even smaller and can penetrate through dentin to the cementum. Calcium hydroxide works by a hydrolysis reaction in which the OH^- ion cuts protein chains and bacterial endotoxin into pieces as it breaks chemical bonds. It does this by inserting water molecules between the carbon-carbon bonds (and breaking C-C bonds by the process of hydrolysis), the backbone of proteins and endotoxin. So if the pearls on a pearl necklace represent atoms and the string between the pearls represents C-C bonds, $\text{Ca}(\text{OH})_2$ is like a pair of scissors that cuts the string (hydrolyzes the bonds) between the atoms breaking the protein down into harmless non-functional pieces. It is a tissue solvent! It also kills bacteria and it dissolves the endotoxin (bacterial LPS).

However $\text{Ca}(\text{OH})_2$ was not capable of eliminating all the bacteria, it helped to reduce the bacteria remaining in the canal after the irrigation.

The concept of single visit root canal treatment is based on the entombing theory, which the large number of microorganisms removed during cleaning and shaping and the remaining bacteria entombed by the root canal obturation, therefore it will miss the essential elements to be survive nutrition and space. In addition, the antimicrobial activity of the sealer or the zinc (Zn) ions of gutta-percha can kill the residual bacteria.^[4-10]

Adjuncts to Render Efficient and Faster Treatment in Single Visit Endodontics

Pain control

It relaxes the patient and saves time.

It is preferable to use a long acting local anesthetic agent such as bupivacaine or etidocaine. It also helps to control post-operative pain as compared to short acting local anesthetic like lignocaine. Pariorokh^[5] has stated in 2012 that patients who receive bupivacaine as the anesthetic agent in mandibular molars for single-visit endodontic treatment of irreversible pulpitis as compared to those who had lidocaine as the local anesthetic has significantly less early postoperative pain and also used fewer analgesics. For better success rate of the anesthetic efficacy use of 4% articaine can be incorporated as compared to traditional use of lignocaine as observed by Roberston.^[6]

Sometimes supplemental anesthesia is indicated along with the standard injection.^[5]

These include:

- i. Intra-pulpal injections
- ii. Intra-osseous injection
- iii. Periodontal ligament injection

Access cavity preparation

While performing single visit endodontics, the objective is to perform the treatment in minimum time without compromising the quality of treatment. To achieve this goal use of conventional access cavity preparation by using hand piece and new burs along with use of ultrasonic system can be considered, as visibility will be better and also more effective in exploring canal orifices and calcifications present.^[1]

Isolation

The use of the rubber dam is mandatory in root canal treatment because of its following advantages:

1. Patient is protected from aspiration of instruments, tooth debris, medicaments and irrigating solutions.
2. Soft tissues are retracted and protected.
3. A surgically operating field is isolated from saliva, blood and other tissue fluids. It also reduces the risk of cross contamination of the root canal system with the spread of infectious agents.
4. Visibility is improved. It provides a dry field and reduces mirror fogging.
5. Efficiency is increased.

Magnification light

Use of high quality magnification in dentistry improves both the quality and speed of treatment, hence suitable for single visit endodontics.^[1] Santos Accioly Lins C, et al.^[7] gave a systemic review on operating microscope stating that use of operating microscope provide a marked significant improvement in vision of operative field thereby offering better quality jobs and a higher success rate.^[8-10]

Use of irrigants

Use of a suitable irrigant should be incorporated so as to improve the disinfection of the canal thereby enhancing the treatment outcome.

Single Visit Endodontic Therapy: Acceptance

The main concern among dentist that had probably held back the single visit endodontic therapy is the common association of its post-operative pain and the regular failure of the treatment outcome previously observed.

Postoperative pain

Postoperative or intraoperative flare-up and pain are often the measure of the success or failure of single visit treatment, although pain during treatment has been proved to have no effect on long-term outcomes. Postoperative pain at the mild level is common in root canal treatment which may be the result of over-instrumentation, over-filling, passage of medicine or

infected debris into the periapical tissues, damage of the vital neural or pulp tissues or central sensitization. The preponderance of the research to date has shown no significant difference in postoperative pain has been found when one-visit RCT was compared with two-visit treatment, especially in teeth with vital pulps.

Summary

With the advent of technological advancement and emergence of new gadgets, evidence based dentistry and more scientific deliberations and the concept of maximum dentistry in minimum visits led to a resurgent impetus towards laying down of various protocols to enable dentists to venture into single visit endodontics with reasonable level of outcome.

Single visit root canal treatment versus the multiple visit root canal treatment has been the subject of a long standing debate within the dental community, when the clinicians are faced with choices of which treatment should be offered to patients, the central issues that should be considered are effectiveness, complication, cost and probably patient /operator satisfaction.

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