

Review on Single Visit Endodontics

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Abstract

A successful root canal treatment relies upon adequate shaping and cleaning of root canal system followed by a 3- Dimensional obturation.. Single visit endodontics can be considered as a viable option as it has many advantages particularly convenience of patient due to reduced number of clinical visits and without compromising the quality of the treatment. This article focuses on various aspects of single visit endodontics which includes advantages, disadvantages, adjuncts and difference in clinical practice between single and multiple visit endodontics.

Summary

In the past few years single visit endodontics have gained popularity and acceptance. Studies have shown that there is no difference in quality of treatment, or success rates between single visit and multiple visit treatment. This

goal can be achieved by using recently developed advanced NiTi rotary files, irrigation devices, combination of irrigating solution. In single visit endodontics bacterial regrowth can be prevented which happens due to fail in temporary seal.

Keywords: Single visit endodontics, Oliets criteria, adjuncts.

Introduction

The use of additional disinfecting agents apart from irrigants used during cleaning and shaping procedure in the conventional multi visit root canal treatment targets mainly to diminish microorganisms and their byproducts before root canal obturation. Calcium hydroxide (Ca(OH)₂) paste is the most researched and widely used intracanal medicament .^[1] The approach of single visit root canal treatment is based on the entombing theory by which a large number of microorganisms are removed

during cleaning and shaping^[2,3] and the residual bacteria entombed by the root canal obturation, therefore depriving essential elements like nutrition required for the microorganism to survive.^[4,5] Moreover, the antimicrobial activity of the sealer or the zinc ions of gutta-percha can kill the residual bacteria.^[6,7]

Single-Visit Endodontic Therapy

Single-visit endodontic therapy is defined as 'the conservative non-surgical treatment of an endodontically involved tooth consisting of complete biomechanical cleansing, shaping and obturation of the root canal system during one visit.'^[8]

Selection Criteria for Single Visit Endodontics

Oliets Criteria:

- Positive patient acceptance
- Sufficient time to complete procedure
- Absence of acute symptoms required drainage
- Absence of anatomic obstacles and procedural difficulties^[9]

Indications for Single Visit Endodontic

- Presence of pain
- Obstinate patient
- Full mouth rehabilitation
- Physically disabled patients
- Uncomplicated vital teet
- Patients whom sedation is require
- To deal with esthetics in case of fractured anterior or bicuspid teeth
- Intentional root canal therapy
- Vital pulp exposures with symptomatic pulpitis
- Non vital teeth with sinus tract^[10,11,12]

Cases when it is difficult to supply a temporary seal between appointments

In vital teeth when , the area of lost tooth structure is quite extensive. This makes it crucial and time-dependent to fix well-fitting temporary restorations on teeth.^[8]

Contraindications for Single Visit Endodontics

Teeth with anatomic anomalies

Acute alveolar abscess cases with pus discharge.

TMJ disorders.

Symptomatic non vital teeth and no sinus tract.

Asymptomatic non vital teeth with periapical pathology and no sinus tract.^[12,13]

Re-treatment cases

Pekruhn^[14] monitored more failures in teeth involved with periapical extension of pulpal disease and symptomatic cases were twice as likely to fail compared with asymptomatic cases (10.6% versus 5.0%). The highest failure rate (16.6%) was seen in endodontic re-treatment cases. Inter-visit use of an antimicrobial dressing, is reasoned to be an essential factor to reduce all infection from the root canals.

According to Waltimo et al ^[15], an inter appointment dressing of Ca(OH)₂ can decrease the number of bacteria within a week

Delano et al ^[16] treated teeth with apical periodontitis, with and without Ca(OH)₂, in one or two visits. The Ca(OH)₂ group showed the greatest development in PAI score, followed by the single-visit group (74% versus 64%). They concluded that the additional disinfecting action of Ca(OH)₂ may increase healing rates by 10%.

Differences in Clinical Outcomes between Single and Multiple-Visit Endodontic Treatment

Microbiological basis for endodontic treatment

Electron microscopic studies have pointed that it is from within the confines of the root canal system bacteria initiated and maintain periapical pathosis

An advanced anaerobic bacteriological technique has been conducted by S JÖGREN to investigate the role of

infection in the prognosis of endodontic therapy by following-up infected canals cleaned and obturated during a single appointment. Post-instrumentation samples were taken and the teeth were then root-filled during the same appointment. They summarized that their findings emphasize the importance of completely eliminating bacteria from the root canal system before obturation. They add that this objective cannot be reliably achieved in a one-visit treatment because it is not possible to eradicate all infection from the root canal without the support of an inter-appointment antimicrobial dressing. The pulps of teeth with apical periodontitis harbored high levels of LPS, and theorized this may be a mechanism by which bacteria produce the apical lesion. The bacterial metabolites and breakdown products playing a significant role in the pathogenesis of apical periodontitis^[17].

Status of the pulp

In an infected vital pulp due to caries exposure the infection is normally found only at the wound surface, where it has resulted in a localized inflammatory response.

On the other hand an infected necrotic pulp produces an apical inflammatory lesion and the aim of root canal treatment is to eliminate the microorganisms from the canal to promote healing of apical periodontitis^[17].

Bacterial elimination

Debridement of the root canal by instrumentation and irrigation is considered the most important factor in the prevention and treatment of endodontic diseases and there is a general agreement that the successful elimination of the causative agents in the root canal system is the key to health. Sodium hypochlorite (NaOCl) irrigation plus mechanical instrumentation rendered 33% of the canals bacteria-free after the first appointment. Therefore intracanal medication, specially calcium hydroxide, has

been widely used in attempts to kill any bacteria remaining after instrumentation and irrigation.

Although the use of intracanal medication will lower the bacterial count in infected root canals, it fails to obtain the total elimination of bacterial organisms^[17]

Bacterial endotoxins elimination

The objective of root canal treatment on necrotic teeth should be not only the elimination of living bacteria but also the inactivation of the toxic effects of bacterial endotoxins. The irrigation solutions were ineffective against LPS, while the intracanal medication dressing with Ca(OH)₂ appeared to inactivate the cytotoxic effects of the endotoxin.

Khan et al tested the hypothesis that Ca(OH)₂ denatures IL-1 alpha, TNF-alpha, and CGRP. Human IL-1 alpha, TNF-alpha and CGRP were incubated with Ca(OH)₂ for 1-7 days. At the end of the incubation period, the pH of the samples was neutralized, and the concentrations of the mediators were measured by immunoassays. The analyzed data indicated that Ca(OH)₂ denatures IL-1 alpha, TNF-alpha, and CGRP by 50-100% during the testing periods.

They concluded that denaturation of these proinflammatory mediators is a potential mechanism by which Ca(OH)₂ contributes to the resolution per radicular periodontitis^[17].

Postoperative pain

Postoperative 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

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

The introduction of better disinfecting systems have equivalent or improved anti-microbial efficacy against *E. faecalis* compared with previously used irrigants. So far there is paucity of research-based data available to support the efficacy of current materials and techniques in single-visit endodontic therapy. More evidence-based studies have to be published to advocate single-visit endodontic therapy in apical periodontitis cases. Until then it is better to use an intracanal medicament, such as Ca(OH)₂, within a multiple-visit regimen for treatment of teeth with apical periodontitis³^[1]

Patient Advantages

- Patient convenience and economical.^[18]
- Instant placement of coronal restoration provide better coronal seal
- Patient convenience – Patient does not have to endure the discomfort of repetitive pricking of local anesthesia and no additional appointments.
- Immediate esthetic achievement
- Reduced intra appointment pain: Temporary restoration can lead to seepage of fluid resulting in mid treatment flare up.

Patient Disadvantages

- A single long appointment can be inconvenient to some patients.
- If haemorrhaging or exudation occurs, it can be difficult to control and complete the treatment at the same visit
- Treatment of calcified, multiple canals may cause stress for both the patient and the clinician.^[8]

Adjuncts To Render Efficient And Faster Treatment In Single Visit Endodontics

Pain control

It is better to use a long acting local anesthetic agent such as bupivacaine or etidocaine. It aids in reducing post-operative pain over short acting local anesthetic like

lignocaine. For better anesthetic efficacy use of 4% articaine can be included as compared to traditional use of lignocaine as observed by Roberston^[19]. Sometimes supplemental anesthesia is indicated along with the standard injection^[20].

Isolation

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

Patient is secured from ingestion of instruments, tooth debris, medicaments and irrigating solutions.

Soft tissues are retracted and protected.

A surgically operating field is isolated from saliva, blood and other tissue fluids.

It also decreases the risk of cross contamination.

Greater visibility

Capability is increased^[21]

Magnification with light

Use of high quality magnification in dentistry increases the standard of the treatment and reduces working time, hence appropriate for single visit endodontics. Currently, the gold standard for the practice of endodontics necessitates the application of a microscope.

Low magnification (3x – 8x) Appropriate for examination of tooth orientation and positioning of bur or ultrasonic tip.

Medium magnification (8x – 16x) commonly used in non-surgical and surgical endodontic procedures as it provides an acceptable field of view and depth of field.

High magnification (16x – 30x) Employed mostly for close-up examinations and inspections of minute anatomies, e.g., calcified canal orifice and minute cracks.

Shaping and cleaning

Instead of preparing the root canal in apical-cervical direction techniques which avoid problems like apical extrusion of debris can be used. These techniques are

called cervical or coronal flaring techniques, in which root canal is prepared in cervical apical direction.

- The crown down technique
- The crown down pressure less technique
- The double flaring technique
- The preflaring technique

Single-File Rotary Systems

Single-file rotary systems are classified to two groups: continuous rotating and reciprocating files, based on type of their motions. Wave One–Dentsply-Maillefer, and Reciproc-VDW, have reciprocating motions while Neoniti–Neolix One Shape-Micro-Mega, HyFlex/EDM-Coltene, Whale dent-Swiss, and XP-endo shaper–FKG Swiss apply continuous motions. [22]

Endox endodontic system

The Endox endodontic system is the electronic sterilisation and devitalisation of the root canals by means of the application of high frequency current that produces a temperature increase inside the root canal. This results in the vaporization of pulp tissue and the bacteria content present.

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.

NaOCl

Saponification, amino acid neutralization, and chloramination reactions

Increasing the efficacy of NaOCl:

Possible ways to improve the efficacy of sodium hypochlorite preparations in tissue dissolution are the temperature of the solutions, ultrasonic activation, and increased working time

Increase in temperature of low-concentration NaOCl solutions enhance their immediate tissue-dissolution capacity. The capacity of a 1% NaOCl at 45°C to dissolve

human dental pulps was found to be equal to that of a 5.25% solution at 20°C^[23].

EDTA

Smear layer removal can be done by constant rinse with 5 ml of 17% EDTA for 3min^[23]. A 1-min application of 17% EDTA together with ultrasonics is capable for smear layer and debris removal in the apical region of the root canals^[24].

MTAD

It is a mixture of 3% doxycycline, 4.25% citric acid and detergent-Tween 80. It is a combination of chelating and antibacterial properties. They do not dissolve organic tissue and are intended for use at the end of chemomechanical preparation after sodium hypochlorite^[25]

Tetraclean

Tetraclean is a combination of doxycycline hyclate an acid, and a detergent. It is also more efficacious than MTAD against *E. faecalis* in planktonic culture and in mixed species in vitro biofilm^[26]

Chlorhexidine

Chlorhexidine is a powerful antiseptic, which is extensively used for chemical plaque control in the oral cavity. Aqueous solutions of 0.1 to 0.2% are advocated for that purpose, while 2% is the concentration of root canal irrigating solutions usually found in the endodontic literature^[27]

Q MIX

Q mix is an irrigation solution used as a final rinse. It is a combination of CHX with EDTA and a surfactant solution to improve penetration in dentinal tubules.

The EndoActivator System

The EndoActivator System is a sonically driven canal irrigation system. It consists of a transportable handpiece and 3 types of one usable polymer tips of different sizes. These tips are declared to be well built and resilient and

do not crack easily. Their smooth nature controls it from cutting dentin. Vibrating the tip, in together with moving the tip up and down in short vertical strokes, produces a powerful hydrodynamic phenomenon. This might be operated 10,000 cycles per minute (cpm) has been shown to optimize debridement and promote disruption of the smear layer and biofilm. The EndoActivator System was reported to be able to effectively clean debris from lateral canals, remove the smear layer, and dislodge clumps of simulated biofilm within the curved canals of molar teeth^[28]

Use of laser

Bacteria are known to penetrate depth of 600 to 10000 micro meters whereas the irrigant can penetrate a depth of around 100 micrometer. Laser has been used lately for better disinfecting of the root canal and it gives access to the deeper area of dentinal tubules of around 1000 micrometer. Thus laser improves the overall disinfection of the root canals thereby improving the treatment outcome^[29]

Ultrasonic Irrigation

Ultrasonic irrigation can be used as an sporadic irrigation or a continuous ultrasonic irrigation. In sporadic flushed ultrasonic irrigation, the irrigant is supplied to the root canal by a syringe needle activation of irrigant is done with the use of an ultrasonically oscillating instrument.^[30]

Conclusion

Occurrence of post-operative pain is not a valid comparison point of reference between single- and multiple-visit endodontic therapies. Thus, the present literature review suggests that there is no difference in success rate between single- and multiple-visit endodontic therapies. However, an ideal case selection and clinical diagnosis important. For this the following should be considered for an evidence- based practice of single-visit endodontic therapy.

Operator ability and clinical experience

Single-visit root canal treatment is a procedure to be performed only by experienced.

Clinical skill

Time and auxiliary utilisation

As per the guidelines for single-visit endodontic therapy, the majority of cases should be completed within 45 to 60 minutes^[8].

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