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Review Article

Single visit endodontics

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ABSTRACT

A successful endodontic treatment depends upon localization, proper chemo mechanical preparation of the root canal system, debridement, shaping, disinfection, and three-dimensional obturation of canal system. To achieve this, endodontic therapy used to be performed in multiple visits for complete disinfection of the canals in other words for the better success of endodontic therapy.¹ One-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'.² The concept of single visit root canal treatment is predicted on the entombing theory,³ which states that the large number of microorganisms are removed during cleaning and shaping-^{4,5} and therefore the remaining bacteria are entombed by the root canal obturation, and it'll miss the essential elements to survive; nutrition and space.-^{6,7}. The recent advances, helps the dental practitioners and endodontists to perform the root canal treatment in single visit.

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1. Introduction

A successful endodontic treatment depends upon localization, proper chemo mechanical preparation of the root canal system, debridement, shaping, disinfection, and three dimensional obturation of canal system. To achieve this, endodontic therapy used to be performed in multiple visits for complete disinfection of the canals in other words for the better success of endodontic therapy.¹ One-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'.² The concept of single visit root canal treatment is predicted on the entombing theory,³ which states that the large number of microorganisms are removed during cleaning and shaping^{4,5} and therefore the remaining

bacteria are entombed by the root canal obturation, and it'll miss the essential elements to survive; nutrition and space.^{6,7} The recent advances, helps the dental practitioners and endodontists to perform the root canal treatment in single visit.

1.1. Selection criteria for single visit endodontics

1.1.1. Orients criteria⁸

1.1.1.1. Positive patient attitude. Patient should be cooperative and prepared for single visit endodontics. Noncooperative patients with TMJ problems, limited mouth opening should be avoided for single visit endodontics

1. Sufficient time to complete procedure
2. Absence of acute symptoms requiring drainage through the canal and of persistent continuous flow of exudate or blood.

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3. Absence of anatomic obstacles like calcification in the canals and procedural difficulties (ledge formation, blockage, perforation, inadequate fills).

1.2. Indications

1. Uncomplicated vital teeth
2. Physically compromised patient
3. Medically compromised patients
4. Fractured anterior where esthetics is a concern
5. Apprehensive but cooperative patient
6. Sedation
7. Uncomplicated non vital teeth with sinus tract

1.3. Contraindications

1. Teeth with anatomic anomalies for e g calcified and curved canals
2. Patients with allergies or previous flare ups
3. Acute alveolar abscess cases with presence of pus discharge
4. Patients who cannot keep mouth open for long duration (TMJ disorders)
5. Symptomatic non vital teeth and presence of no sinus tract
6. Asymptomatic non vital teeth with presence of periapical pathology
7. Patients who have acute apical periodontitis with severe pain on percussion
8. Teeth with limited access

1.4. Advantages

1. Patient comfort
2. Minimizes fear and anxiety
3. Familiarity of the canal anatomy
4. Reduced intra appointment pain
5. Restorative consideration
6. Economic

1.5. Disadvantages

1. Tiring for patient
2. Flare ups
3. Hemorrhage
4. Extremely fine, calcified, multiple canals cause stress for both the patient and the clinician
5. Inexperienced clinicians

2. Single Visit Endodontic Therapy: Acceptance

2.1. Healing rate

2.1.1. Post operative healing

Healing processing after any endodontic therapy will usually occur following an accurate diagnosis, proper case selection and the use of skilled techniques of treatment.

These procedures are based upon known biological principles incorporated into the technique triad namely biomechanical preparation of the canal system, debridement and disinfection and complete obturation of the prepared canals. All of these objectives must be achieved in order to ensure a successful procedure.⁹ In many studies it was found that there was no significant difference in healing rate between single and multiple-visit root canal treatment in teeth with infected root canals (80.1% vs 80.0%).

The short- or long-term follow-up of the bone radiographic image and size of the lesion is the most commonly used technique to evaluate the healing, usually based on the PAI score developed by Orstavik et al.^{10,11}

1. PAI 1: normal periapical structure are seen
2. PAI 2: small changes in the bone structure not a specific characteristic of apical periodontitis
3. PAI 3: changes in the bone structure with mineral loss characteristic feature of apical periodontitis
4. PAI 4: well-defined apical radiolucency seen
5. PAI 5: severe periodontitis with exacerbating features and bone expansion are evident

2.2. Endodontic flare-up and pain

The American association of endodontists defines an endodontic flare-up as an acute exacerbation of an asymptomatic pulp or periapical pathosis after the initiation or continuation of root canal treatment.

The etiology for flare ups are numerous and often multifactorial. Dr. Seltzer¹² proposed a number of hypotheses, some of which may be interrelated. They include:

1. Microbial factors
2. Change in periapical tissue pressure
3. Local adaptation syndrome alteration
4. Effects of chemical mediators
5. Immunological phenomena
6. Psychological factors

Flare-ups are caused when microbial toxins get extruded beyond apical foramen causing acute inflammatory response. This usually happens during either over instrumentation or over obturation. Its prevalence ranges between 3 and 58 percent.¹³ Postoperative pain occurs mainly due to acute inflammation in the periradicular tissue caused by the penetration of microorganisms from the root canal during endodontic retreatment.¹¹ Postoperative pain depends upon number of visits as well as preoperative factors, preoperative complications, the periapical index (PAI) score, the size of the radiolucency, the quality of the coronary restoration, intraoperative factors, the intracanal medications, tooth localization, inadequate instrumentation, extrusion of intracanal medicament, age,

sex, periapical pathosis, and apical debris extrusion and irrigants extrusion.^{14,15}

During the treatment, debris comprising of necrotic tissue, bacteria and their products are commonly pushed into the periapical area which leads to inflammation or exacerbation of previously present inflammation, resulting in post endodontic pain. Teeth that had non-vital pulp before treatment were associated with a significantly greater occurrence of post-obturbative pain. The reason for longer duration of pain with manual instrumentation could be because of higher debris load in the periapical area as a result of piston like effect generated with manual instrumentation.

Pain relief in case of over-instrumentation is often dependent on an analgesic strategy. The under-instrumented case may require further instrumentation to the correct measurement as well as analgesic. Another study reported that a combination of calcium hydroxide and chlorhexidine intracanal medications was recommended to reduce postoperative pain with preexisting symptoms, in retreatment cases. Nonsteroidal anti-inflammatory drugs (NSAIDs) have been shown to be effective for managing pulpal and periapical pain. However due to renal effects of NSAIDs as well as interactions with many anti-hypertensive drugs, acetaminophen should be considered for post treatment pain in patients with known sensitivity to NSAIDs or aspirin. Pretreatment with NSAIDs for irreversible pulpitis should have the effect of reducing pulpal levels of the inflammatory mediator prostaglandin E2 (PGE2).

3. Pain Management

Pain management in endodontics depends on the accurate diagnosis of the cause of the pain. The methods by which an accurate diagnosis can be made are:¹⁶

1. Clinical examination
2. Periapical testing
3. Pulp testing
4. Radiographic examination
5. The practitioner must be able to differentiate Odontogenic pain from non-odontogenic pain

Ideal endodontic therapy would eliminate all pain that exists in the involved tooth. But, the physiodynamics of the inflammatory process do not allow pain to immediately disappear once the source of the pain is eradicated.

An acute inflammatory process causes increase in the hydrodynamic pressure in periodontal ligament space, resulting in a pain response. This inflammatory process may arise during the root canal procedure. These include hemorrhage resulting from pulpal extirpation, cleaning and shaping of the root canal systems, irrigation, intracanal medications and/or root canal obturating materials. Any kind of Injury to the periradicular tissue initiates the

inflammatory cascade. Inflammatory mediators; histamine, serotonin, bradykinin, prostaglandin, and leukotriene are released, causing increased vascular permeability and eventually pain.

The main function of analgesic use is pain relief. Nonsteroidal anti-inflammatory drugs inhibit the synthesis of prostaglandin by decreasing the activity of the enzyme cyclooxygenase, which results in decreased formation of prostaglandin precursors. Prophylactic oral administration of NSAIDs before RCT can block the cyclo oxygenase pathway and by this application, the pain sensation can be blocked even before it begins. researchers have showed that preoperative administration of NSAIDs cause decrease in pain level at the initial hours after RCT. By administering NSAIDs prior to root canal therapy, the cyclo-oxygenase pathway can be blocked and the pain sensation can be prevented before it even begins.¹⁷

3.1. Opioids

It should be considered adjunctive drugs that act to enhance overall analgesia at the cost of increased adverse effects.

3.2. Corticosteroids

It can be used in specific situations where the pain is inflammatory in origin, where there is no infection and where there are no contraindications to the chosen drug being used, like emergencies (adrenal crisis, anaphylaxis and allergic reactions), severe post-operative swelling, following severe trauma, periapical nerve sprouting and acute apical periodontitis following removal of an acutely inflamed pulp and for some oral ulcerations, mucosal lesions that cannot be managed with topical medications.¹⁸ In endodontics the importance of drug administration can be explained by three phases: pre-operative, intra-operative and post-operative. Pre-operative pain management involves administration of local anaesthesia and prophylactic medication. Some patients report with a hot pulp (dental pulp that does not respond to local anesthesia), wherein premedication with specific NSAIDs may be required.

3.3. Single visit endodontics vs multiple visit endodontics:

The two basic parameters used for the comparison of single-visit and multiple-visit endodontic therapy are:

1. Incidence of post-operative pain and flare-ups
2. Success versus failure rates

3.4. Post-operative pain

Fear of post-operative pain following treatment is the biggest factor in avoiding single-visit endodontic therapy. A various number of studies and research have been done

to compare the incidence of post-operative pain in single-versus multi-visit endodontic therapy. Although a number of studies in various literature showed that there is no significant difference between the two treatment protocols as far as incidence of post-operative pain is considered, there is a lack of evidence-based data to reinforce this.^{19,20}

3.5. This can be attributed to following reasons

The difference in criteria included (vital versus non-vital), variability in sample size, subjective nature of the pain interpretation and evaluation, and pre-operative symptoms of patients (with or without preoperative pain) patients's anxiety regarding the treatment can alter the incidence of reported pain experience

3.6. Success versus failure rates

Endodontic success indicators can be evaluated as short term or long term. The short-term indicators concern the absence of any postoperative discomfort. Long-term success of any treatment is dependent on various criteria, including case selection, treatment procedures and protocols, time management and sufficient duration of recall appointments. Long time success is based mainly on the healing of periapical lesions whenever present, and the prevention of new lesion.

Most of the studies in various literature indicate that there is minor or no substantial difference in the success rates of single- and multiple-visit endodontic therapy. A study by Jurcak et al reported 89% success rate following single-visit endodontic therapy. Despite Soltanoff's report of considerably more pain in association with single-visit endodontic treatment, he found that both techniques provided success rates exceeding 85%. According to Peters and Wesselink,²¹ complete radiographic healing was observed in 81% of the cases treated in one visit and 71% of the cases treated in two visits. Overfilling has been identified as a factor associated with a lower success rate (Sjogren et al.1990).²² The teeth in which there was evidence of the periapical extension of pulpal disease had significantly higher incidence of failure. There was also higher incidence of failure in those teeth that were retreated endodontically.

A retrospective study by Field et al.²³ concluded that no statistically significant differences were observed between the two treatment protocols based on gender, age, arch or provider. However, they proposed that anterior teeth were more successful than posterior teeth. This was in accordance with the findings of Rudner and Oliek.²⁴ This difference is mostly due to the anatomical variations of posterior teeth. On the contrary. Similarly, a comparable percentage of radiographic healing was seen in both the treatment protocols but the Ca(OH)₂ group (multiple-visit) showed fewer failed and more improved cases.

The reasons for differences in the percentage of success and failure rates in studies and opinion among the

researchers can be due to:^{25–27}

1. The original investigators in their research did not treat acutely infected or abscess teeth in a single visit.
2. Lack of good unbiased studies that can be used for clinical decision making
3. Due to the difference in the definition of success as proposed by different authors, the success of an endodontic treatment is often poorly define. Variables such as, the skill of operators, appropriate diagnosis, proper case selection, reviewing radiographs, the techniques and materials used, and the time frame of the treatment can also determine the results.

4. Conclusion

With the advent of technological advancement and emergence of new devices, evidence-based dentistry and more scientific deliberations and the concept of maximum dentistry in minimum visits led to popularity towards 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 have to decide the choice of treatment, the central issues that should be considered are effectiveness, complication, cost and probably patient/operator satisfaction.

The case selection should be done properly and thorough adherence to standard endodontic principles, with no shortcuts, results in successful single-appointment endodontics. Practitioners should attempt single-visit root canal treatment only after making an honest assessment of their endodontic skills, training, and ability.

5. Source of Funding

None.

6. Conflict of Interest

None.

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