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Single-Visit Retreatment in Endodontics: A Comprehensive Review

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ABSTRACT
Endodontic retreatment aims to address the failure of primary root canal therapy and restore periapical health by eliminating persistent or recurrent infection. Traditionally, retreatment has been performed in multiple visits with the use of intracanal medicaments. However, single-visit retreatment is gaining increasing acceptance with advancements in endodontic technology, rotary instruments, irrigant activation systems, and magnification aids. This review explores the rationale, clinical protocols, advantages, limitations, and evidence base surrounding single-visit retreatment. Current literature indicates that single-visit retreatment can achieve comparable success rates to multiple-visit procedures when performed under strict aseptic conditions and with proper case selection. Emphasis is placed on patient-centered outcomes, microbial considerations, procedural efficiency, and long-term prognosis.

Keywords: *Endodontic retreatment, Single-visit, Root canal therapy, Intracanal medicaments, Periapical healing*

1. INTRODUCTION

Endodontic treatment has revolutionized the preservation of natural dentition by eliminating infection and preventing reinfection of the root canal system. However, despite advances in techniques and materials, primary root canal treatment does not guarantee lifelong success. Reported success rates of initial root canal therapy range between 80% and 95%, with failures largely attributed to microbial persistence, missed anatomy, inadequate cleaning and shaping, coronal leakage, or iatrogenic factors such as instrument separation and perforation (Ng et al., 2011; Siqueira & Rôças, 2014).

Endodontic retreatment remains the treatment of choice for teeth with persistent periapical pathosis following primary therapy, unless surgical or extraction alternatives are indicated (European Society of Endodontology, 2019). Historically, retreatments were conducted over multiple appointments with interappointment intracanal medicaments such as calcium hydroxide. The rationale was to reduce bacterial load more effectively and allow time for medicament action.

However, with advances in rotary retreatment systems, bioceramic sealers, cone-beam computed tomography (CBCT), and enhanced irrigation protocols, the feasibility of completing retreatment in a single appointment has increased (Olcay et al., 2018). Moreover, increasing patient demand for efficient treatment, reduced appointments, and evidence showing comparable outcomes has propelled the adoption of single-visit retreatment protocols.

This review provides an updated overview of single-visit retreatment, including indications, techniques, microbiological aspects, clinical outcomes, patient-centered considerations, and long-term prognosis, supported by recent literature.

Rationale for Retreatment

The primary goal of retreatment is to eradicate persistent infection and allow healing of periapical tissues. Failures of primary root canal therapy can arise due to:

1. **Persistent or Secondary Infection** – Most failures are caused by microorganisms resistant to conventional treatment, particularly *Enterococcus faecalis* and *Candida albicans* (Siqueira & Rôças, 2008).

2. **Missed Anatomy** – Untreated canals, fins, or isthmuses may harbor residual infection.
3. **Coronal Leakage** – Defective restorations and recurrent caries permit recontamination.
4. **Iatrogenic Factors** – Ledge formation, instrument separation, transportation, or perforation compromise outcomes.

Retreatment removes previous filling material, disinfects the canal system, and facilitates optimal obturation. The debate remains whether this can be effectively achieved in a single visit or whether multiple sessions with intracanal medicaments provide superior microbial control.

2. SINGLE-VISIT VS. MULTIPLE-VISIT RETREATMENT

Microbiological Considerations

The primary justification for multiple visits is enhanced microbial reduction with intracanal medicaments. Calcium hydroxide, commonly used between appointments, demonstrates antimicrobial activity but is less effective against *E. faecalis* and biofilm-associated organisms (Haapasalo et al., 2007). Moreover, studies have shown that mechanical preparation and irrigation play a more critical role than medicament placement in bacterial reduction (Siqueira et al., 2007).

Single-visit retreatment eliminates interappointment contamination risk, which may occur due to temporary restoration leakage. Furthermore, modern irrigant activation methods, such as sonic or ultrasonic agitation and laser activation, significantly enhance bacterial elimination within one visit (Arslan et al., 2019).

Clinical Success Rates

Systematic reviews and meta-analyses comparing single-visit and multiple-visit retreatments generally show no significant difference in healing outcomes (Figini et al., 2008; Sathorn et al., 2005; Manfredi et al., 2016). A recent review by Martins et al. (2021) concluded that both approaches yield similar long-term success, provided proper cleaning and obturation are achieved.

Postoperative Pain and Flare-ups

Concerns regarding single-visit retreatment often involve postoperative pain and flare-ups. Some studies report a slightly higher incidence of pain in single-visit cases due to extrusion of debris; however, results are inconsistent (Nguyen et al., 2020). Adequate irrigation and negative pressure systems can help mitigate this risk.

Patient-Centered Factors

From a patient's perspective, single-visit treatment offers significant benefits including fewer appointments, reduced cost, minimized anesthesia, and less disruption to daily life. Patients often prefer single-visit treatment unless contraindications exist (Al-Nazhan et al., 2016).

Indications and Contraindications

Indications for Single-Visit Retreatment

- Absence of acute infection with purulent discharge
- Sufficient time and patient cooperation for thorough cleaning and obturation
- Absence of large periapical lesions requiring staged management
- Adequate instrumentation and irrigation protocols available

Contraindications

- Teeth with persistent sinus tract and purulent exudate
- Complex retreatment cases requiring prolonged negotiation of blocked canals
- Procedural complications (perforations, severe ledges, separated instruments) requiring staged treatment
- Patients with limited tolerance for long appointments

Proper case selection remains critical to the success of single-visit retreatment.

3. TECHNIQUES IN SINGLE-VISIT RETREATMENT

1. Removal of Previous Root Canal Filling

- Gutta-percha removal: Heat carriers, rotary retreatment files (ProTaper Retreatment, R-Endo, Mtwo), or solvents (chloroform, eucalyptol).
- Sealer removal: Ultrasonic tips, rotary instruments, and adjunctive solvents.

- Use of CBCT can aid in identifying missed canals and procedural mishaps.

2. Cleaning and Shaping

- Rotary NiTi instruments allow efficient re-preparation of canals.
- Adjunctive use of XP-Endo Finisher or Self-adjusting File (SAF) improves cleaning of canal irregularities.

3. Irrigation Protocols

- Sodium hypochlorite (2.5–6%) remains the gold standard for disinfection.
- 17% EDTA used for smear layer removal.
- Activation techniques: Passive ultrasonic irrigation (PUI), sonic agitation, EndoVac (negative pressure), and photodynamic therapy.

4. Obturation

- Thermoplasticized gutta-percha, warm vertical compaction, or single-cone with bioceramic sealers are recommended.
- Emphasis on three-dimensional obturation to prevent reinfection.

Advantages of Single-Visit Retreatment

- Reduced number of appointments and treatment time
- Lower risk of interappointment leakage and contamination
- Improved patient compliance and satisfaction
- Comparable success rates to multiple-visit treatments
- Cost-effectiveness for both patients and practitioners

Limitations and Concerns

- Potential for increased postoperative pain due to extrusion of debris
- Inadequate time in complex cases may compromise disinfection
- No opportunity for intracanal medicament action in resistant infections
- Operator fatigue during lengthy procedures

Prognosis and Long-Term Outcomes

Success of retreatment is influenced by multiple factors:

- Pre-operative lesion size (larger lesions may show delayed healing)
- Quality of previous treatment and coronal restoration
- Procedural errors (perforations, separated instruments)
- Host immune response

Long-term studies reveal that **retreated teeth have survival rates comparable to primary treatments**, especially when modern techniques are employed (Ng et al., 2011; Olcay et al., 2018). Single-visit retreatment demonstrates similar healing rates at 2–5 years follow-up compared with multiple-visit retreatment (Martins et al., 2021).

4. FUTURE DIRECTIONS

Emerging trends are shaping the future of single-visit retreatment:

- **Bioceramic sealers** with enhanced sealing ability and bioactivity
- **Irrigation adjuncts** like photon-induced photoacoustic streaming (PIPS) and shockwave-enhanced emission photoacoustic streaming (SWEEPS)
- **Nanoparticle-based irrigants and medicaments** targeting resistant organisms
- **Artificial intelligence (AI) and CBCT integration** for case selection and canal morphology prediction
- **Regenerative approaches** in retreatment cases with extensive periapical pathology

These innovations are expected to further improve the predictability of single-visit retreatment.

5. CONCLUSION

Single-visit retreatment represents a paradigm shift in endodontics, offering efficient and patient-friendly solutions without compromising clinical outcomes. Evidence suggests that, with proper case selection and adherence to rigorous disinfection protocols, single-visit retreatment achieves success rates comparable to multiple-visit treatment. The approach reduces interappointment contamination risks, enhances patient compliance, and aligns with modern trends in minimally invasive and patient-centered dentistry. Future advancements in technology and biomaterials are likely to strengthen the role of single-visit retreatment as a mainstream practice in endodontics.

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