

Review

Comparison of Single-Visit Versus Multiple-Visit Endodontic Procedures

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Abstract

The comparison between single-visit and multiple-visit endodontic procedures is a critical topic in modern dentistry, focusing on clinical outcomes, patient satisfaction, and cost-effectiveness. Single-visit treatments consolidate the cleaning, shaping, and obturation steps into one appointment, appealing to patients and clinicians seeking efficiency and convenience. This approach reduces treatment time and associated costs, often achieving success rates comparable to those of multiple-visit procedures. However, concerns about postoperative pain and procedural complications, such as debris extrusion or inadequate obturation, are notable considerations. Multiple-visit endodontics, characterized by the use of intracanal medicaments between appointments, offers the advantage of enhanced microbial control and healing, particularly in cases with severe infections or complex anatomical challenges. Despite the potential for superior outcomes in certain scenarios, this approach requires additional appointments, which can increase costs and inconvenience for patients. Temporary restorations and the risk of reinfection during the interappointment period further complicate treatment. Postoperative pain and patient satisfaction are pivotal in determining the preferred approach. While single-visit procedures may result in immediate discomfort, the absence of interappointment pain and reduced logistical burdens often lead to higher patient satisfaction. Advances in technology, such as rotary instruments and enhanced irrigation systems, have improved the efficiency and efficacy of both approaches, narrowing the gap in microbial reduction and clinical success. The economic and practical implications of single-visit and multiple-visit treatments vary, with each approach offering unique benefits. The choice often depends on patient-specific factors, clinical judgment, and the complexity of the case. A thorough understanding of the merits and limitations of each method allows for tailored decision-making to optimize outcomes and meet patient expectations. Both approaches contribute to successful root canal therapy, highlighting the importance of individualized care in endodontic practice.

Keywords: *Single-visit endodontics, multiple-visit endodontics, postoperative pain, microbial control, patient satisfaction*

Introduction

Endodontic procedures aim to preserve the natural dentition by treating infections and resolving pathological conditions within the root canal system. These procedures have evolved significantly over the years, driven by advancements in techniques, materials, and technology. Root canal therapy is considered a reliable and effective treatment for pulp and periapical diseases, enabling millions of patients to retain their teeth and maintain functional dentition. Traditionally, root canal treatment involves either a single-visit or multiple-visit approach, with each method having distinct benefits and limitations (1).

The choice between single-visit and multiple-visit endodontic procedures is influenced by various clinical, patient-specific, and practitioner preferences. Single-visit endodontics, where cleaning, shaping, and obturation are completed in one appointment, have gained popularity due to its potential to reduce treatment time and improve patient compliance. Proponents of this approach argue that it minimizes patient visits, reduces microbial contamination between sessions, and offers comparable success rates to multiple-visit treatments (2). Conversely, multiple-visit procedures involve at least two appointments, with intracanal medication used between visits to reduce microbial load and ensure better healing outcomes, particularly in complex or severe cases (3).

Microbial eradication remains a critical factor in the success of root canal therapy. Studies have suggested that intracanal medicaments, such as calcium hydroxide, used in multiple-visit treatments can significantly reduce bacterial load compared to a single-visit approach (4). However, concerns about the potential for reinfection during the inter-appointment period and patient discomfort associated with multiple visits have prompted researchers to explore the efficacy of single-visit endodontics. Additionally, postoperative pain and complications have been frequently studied as key indicators of the clinical outcomes for both methods. While some evidence suggests that single-visit procedures may result in slightly higher incidences

of postoperative pain, other studies report no significant difference in pain levels between the two approaches (5).

The debate extends beyond clinical outcomes, encompassing factors such as patient satisfaction, cost-effectiveness, and overall efficiency. Single-visit procedures often appeal to patients due to reduced travel, time, and financial costs. However, for teeth with complex anatomy, extensive infection, or periapical lesions, multiple-visit treatments may provide better long-term outcomes. The differences in patient populations, practitioner expertise, and case selection criteria further complicate direct comparisons between the two approaches. Recent advancements in endodontic technology, including rotary instruments, enhanced irrigation systems, and improved obturation techniques, have contributed to the success of both single-visit and multiple-visit treatments. Understanding the merits and limitations of each approach is essential for evidence-based decision-making in endodontics.

Review

The comparison between single-visit and multiple-visit endodontic procedures has been a topic of significant research, particularly regarding their clinical outcomes, patient experience, and overall efficacy. A key consideration is the microbial reduction achieved during treatment. Multiple-visit procedures traditionally rely on intracanal medicaments, such as calcium hydroxide, to reduce bacterial load between appointments, which has shown efficacy in persistent infections and complex cases. However, recent evidence suggests that advanced irrigation techniques used in single-visit treatments can achieve comparable microbial control, challenging the necessity of multiple visits in certain clinical scenarios (6).

Postoperative pain is another critical factor influencing the choice of treatment protocol. While some studies suggest that single-visit procedures may result in slightly higher immediate postoperative discomfort due to the completion of treatment in one session, other findings report no significant differences in pain outcomes between

the two methods. This variability highlights the importance of individualized case selection and pain management strategies (7). Moreover, patient satisfaction often favors single-visit treatments due to their convenience and reduced time commitment. Nevertheless, the decision must also consider the complexity of the case, with multiple-visit approaches potentially offering superior outcomes in teeth with extensive periapical lesions or anatomical challenges. Ultimately, a tailored approach remains essential for optimizing treatment outcomes.

Clinical Outcomes and Success Rates

Clinical outcomes and success rates are pivotal in evaluating the efficacy of single-visit and multiple-visit endodontic procedures. The success of root canal therapy is often defined by the resolution of symptoms, radiographic healing, and the long-term preservation of the treated tooth. Various studies have analyzed these parameters to understand whether a single-visit approach can achieve outcomes comparable to those of multiple-visit procedures. The resolution of periapical lesions is a critical marker of treatment success. Research indicates that both single-visit and multiple-visit treatments show similar healing rates for teeth with apical periodontitis over extended follow-up periods (8). However, multiple-visit protocols are often preferred for teeth presenting with large periapical lesions or extensive infection. The use of intracanal medicaments like calcium hydroxide in these cases is thought to offer additional antimicrobial effects, which may contribute to enhanced healing outcomes in complex cases.

The eradication of intracanal bacteria plays a fundamental role in determining clinical success. Multiple-visit procedures, traditionally involving interappointment use of medicaments, have been advocated for their potential to reduce bacterial counts more effectively over time. On the other hand, single-visit treatments rely on robust irrigation protocols and mechanical debridement during a single appointment. Contemporary studies utilizing advanced irrigation systems, such as ultrasonic or sonic activation, suggest that these technologies can effectively eliminate bacteria

within a single session, narrowing the gap between the two approaches (9). Nonetheless, practitioners must consider patient-specific factors, such as the initial microbial load and systemic health, which could influence outcomes. Long-term survival rates of treated teeth are another dimension of success. Studies have demonstrated no significant differences in the survival rates of teeth treated using single-visit versus multiple-visit protocols when evaluated over a period of five years or more. Factors such as coronal sealing, post-endodontic restoration, and adherence to standard protocols appear to have a more substantial impact on long-term success than the number of treatment visits (10). This suggests that while both approaches are effective, practitioner skill and attention to detail during the procedure may be more influential determinants of success.

An additional consideration is the occurrence of postoperative complications, which can influence both short- and long-term success. While single-visit treatments may carry a slightly higher risk of postoperative discomfort due to the consolidation of treatment steps, this risk is often manageable with appropriate analgesic protocols. Conversely, multiple-visit procedures have the potential risk of reinfection between appointments if temporary restorations are compromised. Studies emphasize the importance of maintaining an aseptic environment and ensuring proper sealing to minimize complications regardless of the chosen protocol (11). While there is considerable overlap in the success rates of single-visit and multiple-visit treatments, case selection remains a critical factor in determining the appropriateness of each approach. Teeth with extensive anatomical complexity, significant periapical involvement, or previous treatment failures may benefit from the extended microbial control offered by multiple visits. In contrast, straightforward cases with minimal infection may be successfully managed in a single visit, offering the added advantage of reduced treatment time and improved patient convenience.

Postoperative Pain and Complications

Postoperative pain and complications are important considerations when comparing single-visit and

multiple-visit endodontic procedures. These factors influence patient satisfaction, adherence to follow-up care, and perceptions of treatment success. Understanding the underlying causes and frequency of pain and complications associated with both approaches is critical for optimizing clinical protocols. Pain following endodontic treatment is a multifactorial phenomenon, often linked to inflammation in the periapical tissues. The single-visit approach, which consolidates cleaning, shaping, and obturation into one session, has been associated with varying levels of postoperative discomfort. Some studies report that immediate postoperative pain may be more frequent in single-visit treatments, possibly due to apical extrusion of debris during instrumentation or inadequate time for tissue recovery (8). However, this pain is typically transient and subsides within a few days.

The use of intracanal medicaments such as calcium hydroxide between appointments may contribute to pain relief by reducing microbial load and mitigating inflammation in multi-visits. However, inter-appointment pain is not uncommon, and in some cases, can result from temporary restorations that fail to provide an adequate seal. Additionally, teeth with persistent infections or complex anatomical challenges may experience exacerbated symptoms during the interim period, even with the use of medicaments (9). A critical distinction between the two approaches lies in the occurrence of procedural complications. In single-visit treatments, the potential for complications such as overfilling or inadequate obturation arises from the need to complete all treatment stages within one appointment. For instance, studies indicate that obturation quality may be compromised in cases of operator fatigue or time constraints. Conversely, multiple-visit treatments provide additional opportunities to address anatomical complexities and ensure optimal obturation quality, but they carry an increased risk of reinfection due to potential breakdown of temporary restorations (10).

Moreover, postoperative flare-ups, characterized by severe pain and swelling, are a notable complication in endodontic treatment. Both single-visit and multiple-visit procedures are susceptible to flare-

ups, though the incidence may vary depending on case complexity, microbial factors, and preoperative condition. Research highlights that teeth with significant preoperative periapical lesions or those presenting with necrotic pulps are more prone to flare-ups, regardless of the number of treatment visits (11). This suggests that while procedural differences may influence postoperative outcomes, preoperative factors play an equally critical role. In the context of patient management, addressing postoperative pain and complications is essential for fostering positive treatment experiences. Effective pain management strategies, including pre- and postoperative analgesics and anti-inflammatory medications, are integral to minimizing discomfort. Clinicians must also consider the psychological impact of pain on patients, as apprehension regarding treatment can exacerbate perceived pain levels. Clear communication about expected outcomes and potential complications is vital for managing patient expectations and ensuring compliance with follow-up care.

Patient Satisfaction and Convenience

Patient satisfaction and convenience are crucial factors influencing the choice of single-visit versus multiple-visit endodontic procedures. Beyond clinical outcomes, the patient's experience during and after treatment significantly impacts their perception of the procedure's success. These considerations often guide clinicians toward selecting an approach that aligns with the patient's preferences and lifestyle constraints.

Single-visit endodontics is widely appreciated for its efficiency and convenience, as it eliminates the need for multiple appointments (12). For patients with demanding schedules or logistical challenges, completing the entire treatment in a single visit reduces time away from work or personal obligations. Research has shown that patients undergoing single-visit procedures often express higher satisfaction due to the reduced treatment duration and fewer disruptions to their routines (12, 13). Furthermore, the psychological burden of anticipating repeated dental visits can be alleviated, contributing to a more positive overall experience.

On the other hand, multiple-visit treatments may be viewed as more thorough by some patients, especially those who equate longer treatment durations with meticulous care. However, the need for repeated visits can be inconvenient for individuals with limited flexibility or those traveling significant distances to access dental care. Additionally, temporary restorations required between appointments may cause discomfort or complications if they become dislodged, further affecting patient satisfaction (14). Pain perception and anxiety also influence patient satisfaction. While single-visit procedures may result in slightly higher immediate postoperative discomfort in some cases, the absence of interappointment pain and the completion of treatment in one session can outweigh these drawbacks for many patients (15). In contrast, the intervals between multiple visits can allow patients to recover from procedural discomfort, potentially leading to a more favorable assessment of the treatment process. However, the possibility of interappointment flare-ups or reinfections during multiple-visit procedures can diminish this advantage and contribute to dissatisfaction (16).

Cost is another aspect tied to patient satisfaction. While the actual cost of single-visit and multiple-visit procedures may be similar in many cases, patients often perceive single-visit treatments as more cost-effective due to reduced travel expenses and fewer days off work. This perception can be particularly impactful for patients with limited financial resources or those managing complex schedules. Conversely, the extended duration of multiple-visit treatments may increase indirect costs, such as lost income or childcare expenses, which can negatively influence satisfaction levels (17). Communication and patient education are essential in managing expectations and fostering satisfaction. When patients are well-informed about the rationale behind the chosen treatment protocol and its potential outcomes, they are more likely to feel confident in the care provided. Establishing a trusting relationship between the clinician and patient is vital for mitigating anxiety and ensuring a positive experience, regardless of the treatment approach.

Cost-Effectiveness and Time Efficiency

Cost-effectiveness and time efficiency are critical components in evaluating the practicality of single-visit and multiple-visit endodontic treatments. Both approaches have implications for the financial burden on patients, operational efficiency in clinical practice, and overall resource utilization, making these factors vital in the decision-making process.

Single-visit endodontic procedures are often highlighted for their potential to streamline treatment. Completing the cleaning, shaping, and obturation in one session reduces the number of clinical appointments, which can be particularly advantageous for high-volume practices. This approach minimizes chair time per patient, allowing clinicians to treat more cases within the same timeframe. Additionally, from the patient's perspective, single-visit treatments often translate into lower indirect costs, such as travel expenses and lost wages due to fewer appointments (18). These savings can be a deciding factor for individuals with limited financial resources or demanding schedules.

Conversely, multiple-visit treatments may involve higher cumulative costs for both patients and dental practices. The need for multiple appointments increases the overall use of clinical resources, including chair time, temporary restorations, and auxiliary staff involvement. These additional requirements can elevate the direct costs of treatment, especially in settings where overhead expenses are substantial. However, proponents of multiple-visit procedures argue that the potential for improved clinical outcomes in complex cases justifies these increased costs. For example, the use of intracanal medicaments between visits may enhance microbial control and lead to better long-term success rates, potentially offsetting the initial financial investment (19).

Time efficiency also extends to the clinician's workflow. Single-visit treatments reduce the logistical complexity associated with scheduling follow-up visits and maintaining continuity of care. By eliminating the interappointment period, clinicians can avoid challenges such as ensuring the integrity of temporary restorations or managing

patients who fail to return for subsequent visits. On the other hand, multiple-visit procedures may require additional coordination and documentation, which can increase administrative burdens. These logistical factors are particularly relevant in busy practices where maximizing efficiency is a priority (19). The financial implications for dental practices extend beyond immediate revenue. Single-visit procedures can enhance patient satisfaction due to their convenience, potentially leading to increased referrals and long-term loyalty. Conversely, the perception of thoroughness associated with multiple-visit treatments may appeal to patients who value meticulous care, contributing to a positive reputation for the clinician. Striking a balance between these factors is essential for achieving sustainable practice management while meeting patient expectations.

Technological advancements have further influenced the cost-effectiveness of single-visit endodontics. Innovations such as rotary instrumentation and advanced irrigation systems have streamlined the cleaning and shaping process, enabling clinicians to complete treatment efficiently without compromising quality. These tools have narrowed the gap in microbial reduction between single- and multiple-visit procedures, making the former a viable option for an increasing number of cases (20). However, the initial investment in these technologies may pose a barrier for smaller practices, where cost considerations are more restrictive. Ultimately, the choice between single-visit and multiple-visit endodontic treatments involves a complex interplay of clinical, financial, and logistical factors. Understanding the cost implications and time efficiencies of each approach is essential for tailoring treatment to individual patient needs while maintaining a sustainable and efficient clinical practice.

Conclusion

In comparing single-visit and multiple-visit endodontic procedures, both approaches demonstrate effectiveness, with specific advantages and limitations depending on case complexity and patient needs. Single-visit treatments offer

convenience, time efficiency, and cost-effectiveness, while multiple-visit procedures may provide enhanced microbial control in complex cases. Tailored case selection, supported by advancements in endodontic technology, remains crucial for optimizing outcomes. Clinicians must balance clinical success with patient satisfaction to deliver personalized and effective care.

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There is no conflict of interest

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Data availability

Data that support the findings of this study are embedded within the manuscript.

Author contribution

All authors contributed to conceptualizing, data drafting, collection and final writing of the manuscript.

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