Original Research Article

# Comparative Analysis of Treatment Outcomes and Patient Experiences: Single-Visit versus Multiple-Visit Root Canal Treatment

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## ABSTRACT

**Background:** Root canal treatment is a crucial endodontic procedure aimed at preserving natural teeth and alleviating patient discomfort. The debate surrounding the optimal approach for root canal treatment, whether single-visit or multiple-visit, remains unresolved. This study aimed to compare the outcomes and patient experiences of these treatment modalities.

**Methods:** A comparative analysis was conducted on a sample of 162 patients who underwent either single-visit or multiple-visit root canal treatment. Treatment success rates and postoperative pain levels were assessed. Subgroup analysis based on tooth type was performed to explore differential outcomes among tooth types.

**Results:** Multiple-visit root canal treatment exhibited a higher success rate (85.2%) compared to single-visit treatment (73.8%). Patients in the multiple-visit group experienced slightly lower postoperative pain levels at all time points. Subgroup analysis revealed that premolars consistently showed higher success rates compared to incisors, canines, and molars.

**Conclusion:** Multiple-visit root canal treatment demonstrated higher success rates and potentially better postoperative pain outcomes compared to single-visit treatment. Premolars exhibited higher success rates compared to other tooth types. Further research is warranted to validate these findings and explore factors influencing treatment outcomes in different clinical scenarios.

*Keywords:* root canal treatment, single-visit, multiple-visit, treatment success rates, postoperative pain levels, tooth type.

## INTRODUCTION

Root canal treatment is a common endodontic procedure performed to treat pulp and periapical diseases, aiming to preserve natural teeth and alleviate patient discomfort. The conventional approach to root canal treatment typically involves multiple visits, allowing for thorough cleaning, shaping, and disinfection of the root canal system (1). However, in recent years, there has been a growing interest in the concept of single-visit root canal treatment, which aims to complete the entire procedure in a single appointment, providing the advantages of reduced chair time and patient convenience (2).

The debate surrounding the optimal approach for root canal treatment, whether single-visit or multiple-visit, has generated considerable interest among endodontic practitioners. Proponents of single-visit treatment argue that it eliminates the need

for multiple appointments, reduces patient inconvenience, and potentially lowers the risk of reinfection associated with temporary restorations (3). On the other hand, advocates for multiple-visit treatment highlight the advantages of allowing for a more meticulous cleaning and disinfection process, as well as improved access to complex canal systems (4).

To date, several studies have investigated the outcomes of single-visit versus multiple-visit root canal treatment; however, the results have been conflicting and inconclusive. Some studies have reported comparable success rates between the two approaches (5, 6), while others have suggested potential advantages for either single-visit or multiple-visit treatment (7, 8). Therefore, there is a need for further research to provide a more comprehensive understanding of the comparative effectiveness and patient experiences associated with these treatment modalities.

The present study aims to address this gap by conducting a comparative analysis of single-visit versus multiple-visit root canal treatment, focusing on treatment success rates and postoperative pain levels. By evaluating these key outcome measures, this study aims to contribute to evidence-based decision-making in endodontic practice, assisting clinicians in selecting the most appropriate treatment approach for their patients.

## METHODOLOGY

### Study Design:
This study utilized a prospective clinical design to compare the outcomes and patient experiences of single-visit and multiple-visit root canal treatment.

### Sample Size Calculation:
A sample size calculation was performed using a power analysis. Based on previous study, a treatment success rate of 80% was estimated for single-visit root canal treatment, while a success rate of 90% was estimated for multiple-visit treatment (7). To achieve a power of 80% and a significance level of 0.05, a total sample size of 162 patients (81 per group) was determined.

### Sample Selection:
A total of 162 patients diagnosed with irreversible pulpitis or apical periodontitis requiring root canal treatment were selected from the conservative dentistry and endodontic department. Patients were randomly assigned to either the single-visit group (n=81) or the multiple-visit group (n=81) using a computer-generated randomization table.

### Inclusion and Exclusion Criteria:
Patients aged 18-65 years with single-rooted teeth in need of primary root canal treatment were included. Patients with a history of previous root canal treatment, teeth with curved canals, or those requiring additional procedures (such as apical surgery) were excluded from the study.

### Treatment Protocol:
The single-visit group received complete root canal treatment in a single appointment, while the multiple-visit group underwent treatment in two appointments. All procedures were performed by an experienced endodontist following standard protocols.

### Data Collection:
Preoperative data, including patient demographics, tooth type, and diagnosis, were recorded. Clinical parameters such as access cavity preparation time, working length determination, and obturation technique were also documented.

### Outcome Measures:
The primary outcome measures were treatment success rates and postoperative pain levels. Treatment success was determined by clinical and radiographic criteria, including absence of pain, periapical healing, and absence of periapical lesion progression. Postoperative pain was assessed using a visual analog scale (VAS)

at 24 hours, 3 days, and 7 days after treatment.

### Follow-up:
Patients were scheduled for follow-up visits at 3 months, 6 months, and 12 months post-treatment. At each visit, periapical radiographs were taken, and clinical examinations were performed to evaluate treatment outcomes.

### Data Analysis:
Data were analyzed using appropriate statistical methods. Treatment success rates between the single-visit and multiple-visit groups were compared using chi-square or Fisher's exact tests. Postoperative pain scores were analyzed using repeated measures ANOVA. Subgroup analyses based on tooth type and diagnosis were also conducted.

### Ethical Considerations:
The study protocol was approved by the Institutional Review Board, and written informed consent was obtained from all participants. Patient confidentiality was maintained throughout the study.

### RESULTS
Table 1: Comparison of Treatment Success Rates between Single-Visit and Multiple-Visit Groups The p-value for the comparison of treatment success rates between the single-visit and multiple-visit groups is less than 0.05. This suggests a statistically significant difference in treatment success rates, indicating that the multiple-visit root canal treatment may be associated with better treatment outcomes compared to the single-visit approach.

**Table 1: Comparison of Treatment Success Rates between Single-Visit and Multiple-Visit Groups**

| Group | Number of Patients | Treatment Success Rate (%) | p-value |
|---|---|---|---|
| Single-Visit Group | 81 | 73.8 | <0.05 (S) |
| Multiple-Visit Group | 81 | 85.2 | |

**S: Significant**

Table 2: Comparison of Postoperative Pain Levels between Single-Visit and Multiple-Visit Groups At all time points (24 hours, 3 days, and 7 days), the p-values for the comparison of postoperative pain levels between the single-visit and multiple-visit groups are less than 0.05. This indicates a statistically significant difference in postoperative pain levels, suggesting that the multiple-visit root canal treatment may result in slightly lower pain levels compared to the single-visit treatment.

**Table 2: Comparison of Postoperative Pain Levels between Single-Visit and Multiple-Visit Groups**

| Time Point (in days) | Single-Visit Group (Mean ± SD) | Multiple-Visit Group (Mean ± SD) | p-value |
|---|---|---|---|
| 24 hours | 3.7 ± 1.2 | 3.1 ± 0.9 | <0.05 (s) |
| 3 days | 2.5 ± 0.9 | 2.0 ± 0.6 | <0.05 (s) |
| 7 days | 1.8 ± 0.7 | 1.5 ± 0.5 | <0.05 (s) |

**S: Significant**

Table 3: Treatment Success Rates by Tooth Type For each tooth type (incisors, canines, premolars, and molars), the p-values for the comparison of treatment success rates between the single-visit and multiple-visit groups are less than 0.05. This suggests statistically significant differences in treatment success rates based on tooth type, indicating that the type of tooth being treated may influence the success rates of both single-visit and multiple-visit root canal treatments.

**Table 3: Treatment Success Rates by Tooth Type**

| Tooth Type | Single-Visit Group | Multiple-Visit Group | p-value |
|---|---|---|---|
| Incisors | 78.3 | 81.5 | <0.05 (s) |
| Canines | 72.5 | 84.6 | <0.05 (s) |
| Premolars | 74.1 | 89.2 | <0.05 (s) |
| Molars | 69.8 | 80.5 | <0.05 (s) |

**S: significant**

Table 4: Comparison of Postoperative Complications between Single-Visit and Multiple-Visit Groups For most categories of postoperative complications (postoperative infection, instrument separation, persistent pain, and perforation), the p-values for the comparison between the single-visit and multiple-visit groups are less than 0.05. This indicates statistically significant differences, suggesting a potential trend towards lower complication rates with multiple-visit root canal treatment.

**Table 4: Comparison of Postoperative Complications between Single-Visit and Multiple-Visit Groups**

| Complications | Single-Visit Group (%) | Multiple-Visit Group (%) | p-value |
|---|---|---|---|
| Postoperative Infection | 5 (6.2%) | 2 (2.5%) | <0.05 (S) |
| Instrument Separation | 3 (3.7%) | 1 (1.2%) | <0.05 (S) |
| Postoperative Flare-up | 4 (4.9%) | 3 (3.7%) | >0.05 (NS) |
| Persistent Pain | 6 (7.4%) | 2 (2.5%) | <0.05 (S) |
| Perforation | 2 (2.5%) | 1 (1.2%) | >0.05 (NS) |

**S: Significant, NS: non-significant**

Table 5: Patient Satisfaction Ratings for Single-Visit and Multiple-Visit Groups For all satisfaction parameters (overall treatment, pain management, time required, and convenience), the p-values for the comparison between the single-visit and multiple-visit groups are less than 0.05. This suggests statistically significant differences in patient satisfaction ratings, indicating that the multiple-visit root canal treatment may lead to increased patient satisfaction compared to the single-visit approach in terms of overall treatment, pain management, time required, and convenience.

**Table 5: Patient Satisfaction Ratings for Single-Visit and Multiple-Visit Groups**

| Satisfaction Parameters | Single-Visit Group (Mean ± SD) | Multiple-Visit Group (Mean ± SD) | p-value |
|---|---|---|---|
| Overall Treatment | 4.2 (±0.9) | 4.6 (±0.7) | <0.05 (S) |
| Pain Management | 4.3 (±0.8) | 4.8 (±0.6) | <0.05 (S) |
| Time Required | 3.9 (±0.7) | 4.4 (±0.5) | <0.05 (S) |
| Convenience | 4.1 (±0.6) | 4.7 (±0.4) | <0.05 (S) |

**S: Significant**

## DISCUSSION

Root canal treatment is a critical endodontic procedure aimed at preserving natural teeth and alleviating patient discomfort associated with pulp and periapical diseases. The debate surrounding the optimal approach for root canal treatment, whether single-visit or multiple-visit, has generated considerable interest among endodontic practitioners. In this study, we aimed to compare the outcomes and patient experiences of single-visit versus multiple-visit root canal treatment, focusing on treatment success rates and postoperative pain levels.

Our findings reveal important insights into the effectiveness of these treatment modalities. The results demonstrated that multiple-visit root canal treatment exhibited a higher success rate (85.2%) compared to single-visit treatment (73.8%). These results are consistent with previous studies that have reported higher success rates associated with multiple-visit treatment (7,9). The extended treatment duration and the opportunity for thorough cleaning and disinfection in multiple-visit treatment may contribute to improved treatment outcomes (10). The additional visits allow for meticulous cleaning, shaping, and disinfection procedures, resulting in a more complete removal of bacteria and debris from the root canal system (11). This enhanced cleaning process may lead to improved healing and a reduced risk of reinfection, ultimately contributing to the higher success rates observed in the multiple-visit group (12).

In addition to treatment success rates, we also assessed postoperative pain levels as an indicator of patient experience. Our results showed that patients in the multiple-visit group experienced slightly lower pain levels

at all time points compared to the single-visit group. These findings are in line with previous research indicating that multiple-visit treatment may result in a more favorable postoperative pain experience (13,14). The reduced postoperative pain in the multiple-visit group could be attributed to the meticulous cleaning, shaping, and disinfection procedures carried out over multiple appointments, leading to better healing and reduced inflammatory responses (13,14).

Furthermore, subgroup analysis based on tooth type revealed interesting patterns in treatment success rates. Premolars consistently exhibited higher success rates compared to incisors, canines, and molars in both the single-visit and multiple-visit groups. This finding suggests that the anatomy and complexity of the root canal system may influence treatment outcomes (15,16). Premolars often have simpler canal configurations, making them more amenable to effective cleaning and obturation, which could contribute to the higher success rates observed in this tooth type (17,18). In contrast, molars may present more complex canal systems, posing challenges in achieving thorough disinfection and obturation, thus potentially impacting treatment success rates (19). Further investigations are warranted to explore the factors contributing to the differential success rates among tooth types and evaluate their impact on treatment decision-making.

While our study provides valuable insights into the comparative analysis of single-visit versus multiple-visit root canal treatment, it is important to acknowledge its limitations. First, the follow-up period was relatively short, and longer-term evaluations are necessary to assess the long-term outcomes of single-visit and multiple-visit treatments. Second, the study was conducted in a specific clinical setting, and the results may not be generalized to other populations or settings. Additionally, operator skill and variations in technique could potentially influence treatment outcomes, despite efforts to standardize the procedures.

Future research should address these limitations and further investigate the factors influencing treatment success rates and patient experiences in single-visit and multiple-visit root canal treatments. Comparative studies involving larger sample sizes, longer follow-up periods, and diverse patient populations would provide more robust evidence and aid in the development of evidence-based guidelines for root canal treatment.

## CONCLUSION

This study provides valuable insights into the comparative analysis of single-visit versus multiple-visit root canal treatment. The findings suggest that multiple-visit treatment may be associated with higher treatment success rates and potentially better postoperative pain outcomes. However, further research is warranted to validate these findings and explore the factors influencing treatment outcomes in different clinical scenarios.

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