

Comparison of the Efficiency of Disinfection of an Infected Canal with a Single Session and Multiple Sessions. A Case study in University Dental Clinical Center of Kosovo During January 2023-January 2024

^[1] Albion Krasniqi

^[1]University of Prishtina" Hasan Prishtina" Faculty of Medicine- Stomatology, Kosovo
 Corresponding Author Email: ^[1] albionkrasniqi46@gmail.com

Abstract— *Conventional endodontic treatment can be conducted in multiple visits, yet some clinicians suggest that single-visit endodontic treatment has a higher success rate. Both single-visit and multi-visit endodontic treatments have their own advantages and disadvantages. This paper aims to compare the disinfection of infected root canals in one session versus multiple sessions based on data collected from University Dental Clinical Center of Kosovo During January 2023-January 2024. Additionally, it will describe the trend of method treatment in rural vs urban areas, age groups and postoperative complications.*

Index Terms: *Endodontic treatment, Root canal disinfection, Healing rates in endodontics, Single-visit endodontics, Multi-visit endodontics.*

I. INTRODUCTION

Conventional endodontic treatment can be performed in one or multiple visits; however, some clinicians suggest that the success rate of single-visit treatments is higher. Single-visit and multi-visit endodontic treatments each have their own advantages and disadvantages [1]. Meta-analyses conducted on various studies and their results indicate that complications following both single-visit and multi-visit endodontic treatments are similar. Moreover, neither single-visit nor multi-visit endodontic treatment has shown superior outcomes in terms of healing or success rate. Multiple studies report that neither single-visit nor multi-visit treatments can guarantee the absence of postoperative pain [2] [3].

There is a limited number of studies that compare the success rate of endodontic therapy conducted in one visit versus multiple visits. These studies have limitations, with the most common issues including short-term follow-up periods, lack of differentiation between pathological conditions (vital or necrotic pulp, presence of periradicular bone destruction), non-standardized instrumentation and irrigation procedures, multiple operators with varying levels of skill and retrospective evaluations and differing criteria for defining success and failure [4] [5]. This study will present a comprehensive analysis comparing single-visit and multi-visit endodontic treatments in our case study of collected data in University Dental Clinical Center of Kosovo, evaluating their respective success rates and

postoperative outcomes. This analysis aims to provide clearer insights into the efficacy of each approach. Ultimately, this research will contribute to a more informed decision-making process for clinicians regarding the optimal number of treatment visits in endodontic therapy.

II. TREATMENT OF THE INFECTED CANAL IN A SINGLE VISIT AND CONTEMPORARY ENDODONTIC TREATMENT

Inflammation of the root canal can be acute or chronic [1] [6]. Root canal infections are typically polymicrobial, dominated by anaerobic bacteria. Generally, 2–8 types of bacteria are isolated, while single-species infections are rare. Factors influencing canal infection include:

- Type of tooth
- Number and types of bacteria
- Duration of canal exposure

The types of bacteria found in infected canals are similar to those found in dentinal tubules, with the dominant bacteria being *Lactobacillus*, *Streptococcus*, *Propionibacterium*, *Fusobacterium*, *Eubacterium* [3] [7].

1. Assessment of difficulties prior to endodontic treatment

Before starting endodontic treatment, it is essential to consider the anatomical characteristics and individual variations of the teeth being treated, as well as the technical difficulties that may arise during the procedure in accessing the root canal.

2. Establishing an aseptic operative field using a rubber dam

Endodontic treatment must be performed under aseptic conditions. The use of a rubber dam is mandatory in the treatment of infected canals as it creates a sterile environment and prevents further contamination of the canal with microorganisms [8] [9].



Fig. 1. Absolute dry working field

3. Preparation for accessing the canals - endodontic access

It refers to the preparation of the access cavity in the coronal part of the infected tooth. It is important to uncover all the present canals so that a smooth mechanical preparation of each root canal can be carried out without obstruction [10] [11].

4. Mechanical instrumentation of the infected canal

During this phase, the necrotic tissues along with their bacterial colonies are physically removed from the main root canal. With the expansion and preparation of the canal, shaping it for obturation, most of the bacteria in the dentinal tubules are physically removed. Mechanical instrumentation and cleaning of the root canal must be done thoroughly, as the entire necrotic mass needs to be removed. Expanding the lumen of the canal helps eliminate both the bacteria and the nutrient-rich medium provided by the odontoblasts and the tissue in the canal wall. The root canal should be expanded up to 1 mm shorter than the radiological apex [12].

5. Irrigation and chemical disinfection of the infected canal

Root canal preparation is impossible without sufficient irrigation. During instrumentation, some areas are inaccessible, and these areas can only be cleaned using irrigating solutions. The purpose of irrigation is to moisten the canal walls, remove debris efficiently, clean unreachable areas, and provide an antimicrobial solution that is not toxic to vital periapical tissues. Yamada and collaborators recommend using 10–20 ml of irrigant per canal [13] [14].

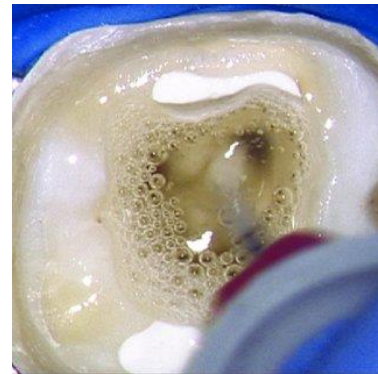


Fig. 2. Clinical Appearance During Root Canal Treatment with Irrigants

This irrigation process is essential for maintaining the cleanliness of the canal and ensuring that it is free of bacteria, debris, and other contaminants, contributing to the overall success of the endodontic procedure.

The most used irrigants in the infected canal are:

- Sodium Hypochlorite (NaOCl): 0.5–5.25%
- Chlorhexidine (CHX): 0.2–2%
- Iodine Compounds
- Hydrogen Peroxide (H₂O₂): 3–5%
- Chloramine: 0.5–2%
- EDTA: 17%
- Citric Acid
- Calcium Hydroxide (Ca (OH)₂)
- MTAD

6. Justification and application of an antibacterial medication within the infected canal

When a tooth is non-vital and has acute inflammation, single-visit endodontic treatment is not recommended. Reducing the number of live bacteria in infected root canals is achieved through mechanical action and irrigation, but certain areas, such as isthmuses, accessory, or lateral canals, may not be thoroughly cleaned due to the brief time the irrigant stays in the canal. Additionally, the presence of residual bacteria can lead to treatment failure.

For this reason, placing medications in the canal and performing treatment over multiple sessions is preferred to reach the depths of the dentinal tubules and prevent reinfection [15] [16].

The role of medications in the root canal is to:

- Kill bacteria
- Reduce inflammation (and thus pain)
- Aid in eliminating apical exudate
- Control root resorption inflammation
- Prevent contamination between sessions

The most commonly used medications in infected canal therapy are:

- Eugenol
- Phenolic compounds
- Camphorated paramonochlorophenol

- Parachlorophenol
- Camphorated parachlorophenol
- Cresatin
- Cresol
- Thymol
- Aldehydes
- Formocresol
- Glutaraldehyde
- Sodium hypochlorite
- Calcium hydroxide
- Antibiotics

7. The Role of Three-Dimensional Filling in Infected Root Canal Treatment

In treating an infected root canal, three-dimensional (3D) filling of the root canal system plays a crucial role. This approach helps entomb microorganisms that may have resisted prior canal instrumentation, irrigants, and medications, effectively isolating them to prevent their access to periradicular tissues. In doing so, the 3D filling acts as a barrier, stopping microorganisms from spreading into surrounding periradicular tissues [17] [18].

A hermetic seal is essential to prevent coronal contamination from saliva, which could otherwise serve as a nutrient source for any remaining microorganisms. The most employed technique for 3D canal filling is **lateral condensation**, utilizing thermoplasticized gutta-percha. This material ensures a more homogenous mass, providing optimal obturation.

can range from loss of consciousness to confusion, headaches, and post-traumatic amnesia. Management typically emphasizes cognitive and physical rest, with a gradual return to activities as symptoms resolve, and careful monitoring to prevent further complications, such as second-impact syndrome [19].

Crush syndrome occurs when prolonged pressure is applied to muscles, often seen in scenarios such as building collapses or prolonged entrapment. It leads to muscle ischemia, necrosis, and subsequent systemic complications, including acute renal failure due to myoglobinuria. Management involves immediate release of pressure, aggressive intravenous fluid resuscitation, and close monitoring of renal function and electrolytes to mitigate the risk of complications [20].

Lastly, *polytrauma* refers to the simultaneous presence of multiple traumatic injuries affecting various body

III. RESEARCH METHODOLOGY

The findings presented in this article are derived from a comprehensive study conducted at University Dental Clinical Center of Kosovo over a one-year period, from January 2023 to January 2024. This study employed a retrospective analysis of 180 cases of endodontic treatment, providing a robust dataset for evaluating the characteristics and

implications of such injuries in the clinical setting. The selection of cases was based on patient records available at the University Dental Clinical Center of Kosovo department, ensuring a diverse representation of endodontic treatment, providing a big picture if one visit or multi-visits was needed to result successful in healing.

Data collection involved meticulous categorization of variables, including gender, age, region and type of visit. Gender and age demographics were analyzed to help on identifying any differences in pain perception, healing, anxiety, and treatment preferences. Understanding these can guide more personalized care, potentially improving patient outcomes and satisfaction.

The research methodology combined a thorough literature review with clinical research to contextualize the findings within the broader landscape of forensic medicine. The literature review involved analyzing previous studies and relevant scientific literature to establish a foundation for understanding outcomes between single-visit and multi-visit treatments. The study received approval from the institutional review board (IRB) of the University Dental Clinical Center of Kosovo, which emphasized the importance of ethical considerations in conducting clinical research. This dual approach of integrating clinical data with existing literature not only enriched the findings but also contributed to the development of evidence-based practices in the management and forensic evaluation of endodontic treatment.

IV. RESULTS AND DISCUSSIONS

The study unveiled a significant gender disparity in the incidence of endodontic treatment with 59% of the cases occurring in males compared to 41% in females. The higher rate of endodontic treatment in males could be due to greater exposure to trauma from physical activities and higher-risk behaviors, societal norms leading to more violent encounters, and a tendency to delay routine dental care. These factors increase the likelihood of severe dental issues that require endodontic intervention.

Table I: Results from the gender distribution of the patients.

Gender		
Patient's gender	Nr.	%
Male	108	60%
Female	72	40%
Total	180	100%

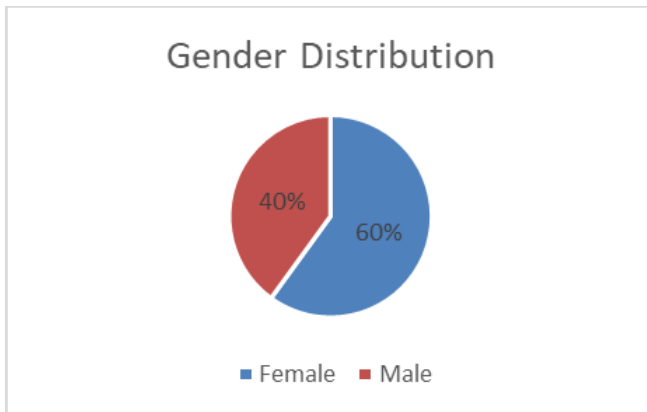


Fig. 3. A pie chart that illustrates the gender distribution of endodontic patients

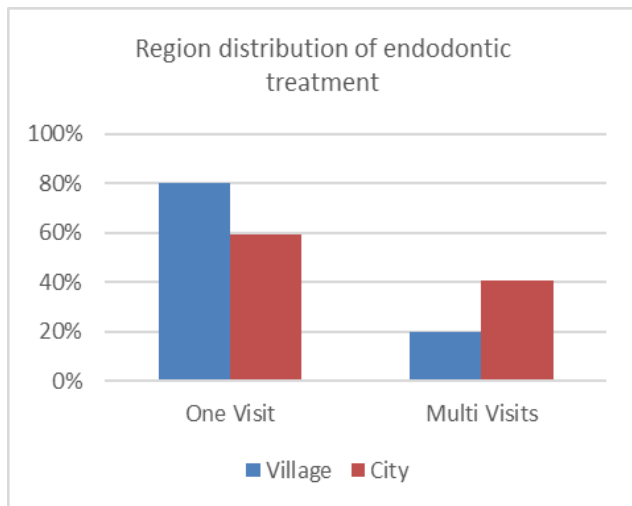


Fig. 4. Chart that illustrates the zone distribution and differences on endodontic treatment

Table II: Results from the region distribution

Type of residence	One Visit	Multi Visits	Total
Village	48	12	60
City	71	49	120

The regional distribution reveals a distinction in endodontic treatment methods between urban and rural areas. Out of 180 cases, 60 originated from rural areas and 120 from urban areas. In urban areas, 59.17% of patients completed treatment in a single visit, while 40.83% required multiple visits. This difference was more pronounced in rural areas, where 80% of cases were single-visit treatments, and only 20% were multi-visit. This trend may be attributed to the proximity of clinical center in urban area, where patients benefit from shorter travel distances, making it more feasible to return for multiple appointment, other factors may be the higher patient health awareness, more insurance coverage, and complex cases requiring staged treatment.

Table III: Results from the study according to age group of endodontic treatment

Age Group	Number of cases	Percentage (%)
1-7 years	7	3.89%
8-18 years	12	6.67%
19-30 years	51	28.33%
30-45 years	68	37.78%
Older than 46 years	42	23.33%
Total	180	100%

The distribution of endodontic treatment cases across age groups in this study reveals significant trends regarding the prevalence of endodontic issues by age.

In summary, the findings show a higher prevalence of endodontic treatments in adults aged 19-45 years, with a notable decline in younger children and older adults. These trends suggest that middle-aged individuals may be the most affected by conditions necessitating endodontic care, possibly due to the cumulative effects of oral neglect or trauma over the years. The data highlights the importance of targeted dental care strategies for different age demographics, particularly in preventing dental complications in high-risk age groups. In our study, we observed that postoperative pain and complications typically occurred following root canal procedures, with the duration ranging from one day to several weeks. The most common postoperative complications we encountered were swelling, sensitivity to pressure, increased tooth mobility, and systemic discomfort.

Table IV: Results from the study according to Postoperative Complications

Postoperative Complications	Percentage of Cases (%)
Swelling	24%
Sensitivity to Pressure	22%
Increased Tooth Mobility	18%
Systemic Discomfort	15%
Pain Severity	30%
Incidence in Females	65%
Excessive Instrumentation	42%
Overfilling	38%
Retreatment with Apical Periodontitis	40%

Regarding pain, we noted a range from mild to more severe forms. The findings on postoperative pain varied between different cases, with no significant differences between single-visit and multi-visit treatments in our study.

Interestingly, in our study, we found that single-visit treatments were associated with greater pain in some instances, which aligns with findings from other studies. However, there were also cases in which single-visit treatments resulted in significantly more postoperative pain when compared to multi-visit treatments.

Currently, a large portion of our dental team avoids single-visit treatments, especially for molars, due to the belief that these treatments may lead to more postoperative pain and complications.

Our findings indicated that postoperative pain was not correlated with age, gender, or tooth location. However, we did find that females in our study experienced a higher incidence of postoperative pain compared to males. Furthermore, we observed that excessive instrumentation and overfilling led to increased pain, and cases involving retreatment with apical periodontitis showed a higher incidence of pain.

In conclusion, our study found no significant differences in postoperative complications between single-visit and multi-visit endodontic treatments, which aligns with the results of previous studies

Moreover, the study revealed notable demographic trends, with a higher prevalence of endodontic treatments in urban areas, particularly among adults aged 19-45 years. The regional differences could be attributed to the proximity of clinical centers in urban areas, making multi-visit treatments more feasible for patients residing there. Additionally, females were found to experience a higher incidence of postoperative pain than males, with factors such as excessive instrumentation and overfilling contributing to increased pain levels.

In conclusion, while both single-visit and multi-visit endodontic treatments are effective for canal disinfection, the choice of approach should be tailored to the specific clinical case and patient preferences. Our findings suggest that neither method is superior in terms of healing rates, but a careful assessment of patient factors such as gender, age, and the complexity of the case should guide the treatment strategy. Further studies with larger sample sizes and longer follow-up periods are needed to fully understand the long-term outcomes and to refine clinical decision-making processes in endodontics.

V. CONCLUSION

This study aimed to compare the efficiency of disinfection in infected root canals treated with single session versus multi-visits endodontic treatments, using data collected from the University Dental Clinical Center of Kosovo between January 2023 and January 2024. The results provide valuable insights into the effectiveness and postoperative outcomes associated with each treatment approach.

The findings indicate that both single-visit and multi-visit endodontic treatments demonstrate similar levels of success in terms of disinfection and healing. There were no

significant differences in postoperative complications such as swelling, sensitivity, tooth mobility, or systemic discomfort between the two approaches. Although a higher incidence of postoperative pain was observed in single-visit treatments, this did not reach statistical significance when compared to multi-visit treatments.

REFERENCES

- [1] K. B., Tretmani I dhembeve me ndyshime periapikale ne nje senace, Prishtine, 2000.
- [2] Cheung GS, Liu CS, J Endod, A retrospective study of endodontic treatment outcome between nickel-titanium rotary and stainless steel hand filing techniques, 2009;35(7):938–943.
- [3] K. CE, Immediate root filling, 1887;29:366–367: Dental Cosmos.
- [4] A. S. C. t. D. a. M. P. Paper., AAE Position Statement. Use of microscopes and other magnification techniques., J Endod, 2012,38(8):1153–1155.
- [5] Del Fabbro M, Taschieri S, Lodi G, Banfi G, Weinstein RL., Magnification devices for endodontic therapy [review]., Cochrane Database Syst Rev, 2009;8:CD005969.
- [6] Ng YL, Glennon JP, Setchell DJ, Gulabivala K., Prevalence of and factors affecting post-obturation pain in patients undergoing root canal treatment., Int Endod J, 2004;37(6):381-391.
- [7] T. WJ, New York Odontological Society, Dent Cosmos, 1901;43:1405–1412.
- [8] Mohammadi Z, Farhad A, Tabrizzadeh M., One-visit versus multiple-visit endodontic therapy – a review, Int Dent J, 2006;56(5).
- [9] S. N. e. al., Influence of infection at the time of root filling on the outcome of endodontic treatment of teeth with apical periodontitis., 1997; c30:297-306.
- [10] T. e. al., Endodontic treatment of teeth with apical periodontitis single vs multi-visits treatment, Endod, 1999;25(5):345-50.
- [11] K. B., Trial suggests no difference between single-visit and two-visit root canal treatment., Evid Based Dent., 2013;14(2):48.
- [12] G. JL., Clinical, radiographic, and histologic perspectives on success and failure in endodontics. Dent Clin North Am., 1992;36(2):379–392.
- [13] B. LS., One-visit endodontics: a new model of reality., DentToday, 1996;15(5):36, 38, 40–36, 38, 43.
- [14] Fox J, Atkinson JS, Dinin AP, et al., Incidence of pain following one-visit endodontic treatment., Oral Surg Oral Med Oral Pathol., 1970;30(1):123–130.
- [15] Akbar I, Iqbal A, Al-Omiri MK., " Flare-up rate in molars with periapical radiolucency in one-visit vs two-visit endodontic treatment.," vol. 414–418., p. 14(3), 2013.
- [16] T. C. Parekh V, "Comparative study of periapical radiographic techniques with apex locator for endodontic working length estimation:an ex vivo study.," J Contemp Dent Pract, vol. 131–134, p. 12(2), 2011.
- [17] G. L. Endodontics, "A bicentennial history against the background of general dentistry.," J Am Dent Assoc., vol. 93(1), p. 78–87, 1976.
- [18] Morgan LF, Montgomery S., "An evaluation of the crown-down pressureless technique.," J Endod., vol. 10(10),

p. 491–498.

- [19] O. S. Rudner WL, " Single-visit endodontics: a concept and a clinical study.," *Compend Contin Educ Dent*, vol. 2(2), p. 63–68, 1981.
- [20] DiRenzo A, Gresla T, Johnson BR, Rogers M, Tucker D, BeGole EA., "Postoperative pain after 1- and 2-visit root canal therapy.," *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*, vol. 93(5), p. 605–610., 2002.



IFERP[®]

Explore Your Research Journey...