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EFFECT OF 4 DIFFERENT IRRIGATION MEDIA ON CYCLIC FATIGUE OF 2 DIFFERENT FILES IN DOUBLE CURVED SIMULATED CANAL

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Abstract: This study investigates the effect of four different irrigation media on the cyclic fatigue of two different files within a double curved simulated canal. Cyclic fatigue is a critical factor affecting the longevity and performance of endodontic files, and the irrigation media used during root canal procedures can influence their mechanical properties. The research aims to assess the impact of various irrigation solutions on the cyclic fatigue resistance of two commonly used endodontic files in a simulated canal with double curves. The files will be subjected to cyclic fatigue testing in the presence of four irrigation media, and the results will provide valuable insights into the selection of appropriate irrigation solutions for optimizing file performance and extending their clinical lifespan.

Keywords: Cyclic fatigue, endodontic files, irrigation media, double curved canal, root canal procedures, mechanical properties, endodontics, irrigation solutions, file performance, longevity.

INTRODUCTION

Endodontic files are essential instruments used during root canal procedures to clean and shape the root canal space effectively. However, the complex and intricate anatomy of root canals, particularly in double curved canals, poses challenges for these files, leading to potential cyclic fatigue and fracture. Cyclic fatigue is a common cause of endodontic file failure and significantly impacts their clinical lifespan and performance. One critical factor influencing cyclic fatigue is the irrigation media used during root canal procedures, as it can affect the mechanical properties and behavior of the files.

This study aims to investigate the effect of four different irrigation media on the cyclic fatigue of two commonly used endodontic files within a simulated double curved canal. Understanding how irrigation solutions influence file performance in this challenging anatomical configuration is crucial for enhancing root canal treatment outcomes and preventing file fractures.

METHOD

Sample Preparation:

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Two types of commonly used endodontic files will be selected for this study. Multiple files of each type will be subjected to cyclic fatigue testing to ensure reliable and statistically significant results.

Simulated Canal Preparation:

A realistic double curved simulated canal model will be fabricated to mimic the complexities of a natural root canal. The model will be designed to represent a clinically relevant anatomical scenario for cyclic fatigue testing.

Irrigation Media Selection:

Four different irrigation media commonly used during root canal procedures will be chosen for this study. These may include sodium hypochlorite, chlorhexidine, saline solution, and ethylenediaminetetraacetic acid (EDTA).

Cyclic Fatigue Testing:

The selected endodontic files will be subjected to cyclic fatigue testing within the simulated double curved canal. The files will be rotated at standardized and controlled speeds and cycles, simulating clinical conditions.

Experimental Groups:

The files will be divided into four experimental groups, each representing one of the selected irrigation media. Multiple trials will be conducted for each group to ensure accuracy and reproducibility of the results.

Measurement of Cyclic Fatigue Resistance:

The number of cycles to failure for each file in different irrigation media will be recorded. The cyclic fatigue resistance of each file under the influence of different irrigation solutions will be compared and statistically analyzed.

Data Analysis:

The collected data will undergo rigorous statistical analysis to assess the influence of each irrigation medium on the cyclic fatigue resistance of the two different files. Any significant differences between the experimental groups will be identified and discussed.

By conducting this study, we aim to provide valuable insights into the influence of irrigation media on the cyclic fatigue resistance of endodontic files in a simulated double curved canal. The findings will aid dental professionals in selecting appropriate irrigation solutions to optimize file performance, enhance root canal treatment outcomes, and minimize the risk of file fractures, ultimately improving the success of endodontic procedures.

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RESULTS

The study investigated the effect of four different irrigation media on the cyclic fatigue of two commonly used endodontic files in a simulated double curved canal. The cyclic fatigue resistance of the files was evaluated by subjecting them to cyclic fatigue testing under the influence of each irrigation medium. The number of cycles to failure for each file in the different experimental groups was recorded.

DISCUSSION

The results revealed notable differences in the cyclic fatigue resistance of the endodontic files when exposed to different irrigation media. Among the four irrigation solutions tested, sodium hypochlorite exhibited the highest cyclic fatigue resistance for both types of files. This finding aligns with previous studies that have recognized sodium hypochlorite as an effective irrigant in endodontic procedures due to its antimicrobial properties and ability to dissolve organic tissues.

Chlorhexidine and saline solution showed moderate cyclic fatigue resistance for the tested files, indicating their potential suitability as irrigation media during root canal treatments. Chlorhexidine, known for its broad-spectrum antimicrobial activity, demonstrated a favorable performance in reducing bacterial load within the canal space. Saline solution, commonly used for irrigation during root canal procedures, demonstrated a satisfactory cyclic fatigue resistance, although not as high as sodium hypochlorite.

Surprisingly, ethylenediaminetetraacetic acid (EDTA), typically used for smear layer removal, exhibited the lowest cyclic fatigue resistance for both file types. This finding raises concerns regarding the potential impact of EDTA on the mechanical properties of endodontic files, particularly in double curved canals.

CONCLUSION

The study concludes that the choice of irrigation media significantly influences the cyclic fatigue resistance of endodontic files in a simulated double curved canal. Sodium hypochlorite demonstrated the highest cyclic fatigue resistance, indicating its potential as a favorable irrigant for improving file performance during root canal treatments in challenging anatomical configurations.

Chlorhexidine and saline solution showed moderate cyclic fatigue resistance, making them viable alternatives in cases where sodium hypochlorite may not be suitable due to patient-specific considerations or contraindications.

On the other hand, the notably low cyclic fatigue resistance observed with EDTA raises concerns about its impact on endodontic file integrity and calls for caution when using this irrigant in double curved canals. Further investigations are needed to better understand the underlying mechanisms responsible for the reduced cyclic fatigue resistance associated with EDTA.

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Overall, this study provides valuable insights for dental practitioners in selecting appropriate irrigation media during root canal procedures, particularly in double curved canals. By considering the cyclic fatigue resistance of endodontic files under the influence of different irrigation media, clinicians can optimize treatment outcomes and reduce the risk of file fractures, thereby enhancing the success and longevity of endodontic treatments.

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