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Review Article

Comparison of instrumentation time and cleaning efficacy of manual instrumentation, rotary systems in permanent teeth: A literature review

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ABSTRACT

Introduction: Root canal treatment is achallenging procedure, it requires complete cleaning of the canals from debris. Several types of instruments are used for this purpose. This review tries to show the most efficient and the least time consuming by comparing manual instrumentation and rotary instrumentation in permanent teeth. **Methods:** Twenty five articles were reviewed for time and cleaning efficacy to compare manual instrumentation and rotary instrumentation in permanent teeth. **Results:** Many studies showed that rotary nickel-titanium (NiTi) systems provided shorter working time. And other studies revealed that both manual and rotary instrumentation resulted in the same cleanliness**. Conclusion:** Rotary NiTi instrumentation has less working time in comparison to manual instrumentation. But in regard to cleanliness no difference was found.

Key words: Rotary, Hand-files, Manual, Engine driven, Nickel-Titanium, NiTi, Cleaning, and Time.

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INTRODUCTION

Proper root canal cleaning is a predictive factor for the success of endodontic treatment.[1]Patient's cooperation during the procedure depends on the time consumed by the operator which may affect the performance efficacy.[2]Numerous studies have confirmed that tactile sensation in cleaning or shaping the root canals is an advantage for the clinician regarding hand instrumentation. On the other hand with the advancement in dentistry, rotary NiTi instruments were introduced to save the clinicians' time and ensure efficacy and cleanliness.Moreover, in the last decade, different designs and configurations of rotary NiTi instruments existed to reduce working time and ensure the cleaning efficacy.[3-5]

According toAzar and Mokhtare (2011) it has been confirmed that rotary NiTi systems are faster and has better conservation of the tooth structure.[6]Rotary NiTi instruments have better cleaning ability in permanent root canals than hand files.The apical third is the critical area of the root canal, and remaining pulpal and inorganic debris have been detected.[7]Interestingly, stainless steel hand instruments revealed equal or even better results concerning cleaning effectiveness when compared with NiTi instruments.[7-8]Unfortunately, according to Rocas et al. (2013), comparison between hand and rotary instruments in terms of bacterial elimination from the root canal have been limited to some in vitro and even fewer in vivo reports.[9]The purpose of this study is to review the available literatures to

compare time and cleaning efficacy of manual and rotary instrumentation in permanent dentition.

METHODS

A total of 25 articles that had been reviewed from three international databases (PubMed, PMC, and Medline) after applying exclusion and inclusion criteria using the following keywords: (Rotary, Hand-files, Cleaning, and Time) and their synonyms.

Inclusion and exclusion criteria

We included articles that studied time required and cleaning efficacy in rotary and hand instrumentation on permanent teeth. All cross-sectional, and randomized controlled in vitro studies were included. Case reports, studies on primary teeth, and articles with questionable sources were excluded.

RESULTS

After careful analysis and application of the inclusion and exclusion criteria, 8 articles have shown that using rotary NiTi instrumentation revealed a shorter working time compared with the manual instrumentation. Regarding bacterial biofilm removal, 7 articles reported a clear effect of Nickel-Titanium files in cleaning over the manual stainless steel files. Conversely, 2 articles observed that cleaning ability of Nickel-Titanium rotary instruments was limited in cleaning C-shaped canals. Moreover, 7 studies have shown no significant differences between manual and rotary techniques in the degree of cleaning capacity. It is important not only to compare the data obtained but also to determine the most efficient technique.

DISCUSSION

The comparison between rotary NiTi files and hand instruments must meet many criteria including cleaning efficacy and time consuming. However, in certain clinical situations such as endodontic treatments, they should ensure the cleanliness of canals and provide short time for operator and patient.Hand instruments are usually and regularly used in root canal treatments. According to many authors they provide clean canal walls by removing more dentin and create a well-shaped pathway.[6, 10-13]However, using these types of instruments is not always satisfactory because data obtained from different studies agreed that manual instrumentation is significantly taking more procedural time than rotary instruments.[6, 14-18]

On the other hand, many studies on rotary NiTi instruments reported remarkable effect of cleaning, bacterial biofilm removal, and preparing, the root canal system effectively.[6, 9, 15, 19-21] As well as revealing a shorter working time during the procedure compared to manual instrumentation.[6, 14-18] It also maintains the original canal curvature during preparation.[22]Additionally,preparing root canal system with rotary NiTi instruments provides better handling of instrument in the hand piece, and reducing operator and patient fatigue.[15, 23]

A et al. (2010) showed that hand files produced better taper qualities and maintained the original canal curvature than rotary systems.[15]andBechelli et al. (1999) also agreed that manual instrumentation create a well-shaped root canals.[24]However, the latter studies state that cleaning ability of rotary NiTi instruments was contradicted by the high percentage of not instrumented canal surfaces in C-shaped canals. Showing less cleaning effectiveness especially in the apical part of curved canals.[15-25]

CONCLUSION

Within the limitations of this study it can be concluded that rotary NiTi instruments have the most efficient working time in comparison with hand instruments, which takesmore operating time.However, regarding the cleaning efficacy they were similar in providing canals cleanliness in permanent teeth.

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