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IP Indian Journal of Conservative and Endodontics

Journal homepage: https://www.ijce.in/

Review Article

A literature review of single file NiTi rotary system in endodontics

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ARTICLE INFO

Article history:
Received 10-05-2021
Accepted 31-05-2021
Available online 30-06-2021

Keywords:
Rotary system
Single file system in endodontics
Cleaning and Shaping of the root canal.

ABSTRACT

The most important step in the success of the root canal treatment is the proper cleaning and shaping of the canal system. Cleaning and shaping means the removal of the entire pulpal tissue from the canal, so that there will be no residue left of any vital structure, that may cause any painful or infectious condition for the future. Some times there occurs difficulty in cleaning as well as shaping of the root canal in the posterior tooth or teeth, where the anatomy of the root is some what curved, and there occur difficulty in removing the vital tissue along with difficulty in achieving the accurate working length of the tooth. In this type of situation use of nickel titanium single file system is quite beneficial.

1. Introduction

The prime concern of the endodontic treatment is to precisely clean and shape the canal system of the tooth with accurate determined working length. A successful endodontic treatment depends upon a proper bio mechanical as well as chemico mechanical preparation of the canal system.[1,2] So the process of cleaning and shaping of the root canal is the prime step in the successful treatment of the endodontic procedure. Literature revealed that there is quite very much difficulty in cleaning the root canal system in the most apical portion of the canal.[3–7] So in the crucial part of the apical third of the root canal system, there still remain controversy regarding the enlargement of the root canal system at apical third for maximizing the cleaning efficiency.[8,9] earlier the cleaning and shaping of the root canal was achieved with the use of hand files that are made up of stainless steel, stainless steel manufactured hand files were having the tendency to break down most commonly in the curved root canal systems that too in the apical most portion of the canal, along with this, use of hand file system is very much time consuming.

To over come the problem of breakage of stainless steel hand file in the apical third of the canal system, there is nickel titanium files, that have the property of super elasticity of which allows easy cleaning of the root canal that too in the curved apical most region of the canal with minimal transportation, with the use of nickel titanium files the chances of procedural errors also reduced.[10,11] The only and the major drawback of the nickel titanium file system is that it is quite expensive along with unexpected fracture.[12] some of the systems that used nickel titanium are “wave one” and “one shape”, they claim that there file system only requires one file for the cleaning as well as shaping of the canal. The working sequence of the file consists of clock wise motion that corresponds to the releasing of the instrument and second motion that is in counter clock wise which corresponds to the direction of cutting of the instrument. It has been showed that the angle that corresponds to the cutting direction that is in counter clock

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https://doi.org/10.18231/j.ijce.2021.019

wise motion is found to be three times greater than the angle in the reverse direction. The prime benefit of using single nickel titanium file system for cleaning and shaping of the root canal is it reduces the shaping time of the canal by 40 percent when it is compared to rotary technique that is traditional, that is used in continuous motion.

The endo concept that used single file system required only minimum or no glide path along with single file that is mostly used for all the root canals complete instrumentation. The concept of single file reduces the time consumption for cleaning and shaping of the root canal along with reduced chances of cross contamination between the patients. This system saves both the time and the cost also.

The NiTi file from dentsply that is wave one come under the category of single use and single file system to clean as well as shape the root canal completely from starting to finish. It shapes the root canal in a continuously tapereing funnel shape, that's how providing the proper boi mechanical design for the canal preparation along with it also provides required three dimensional shape of the canal system which is required for obturation of the canal with gutta parcha.[12–14] This file system works on reverse balanced force action.[13] with the help of a pre programmed motor that helps in moving the file in back and forth reciprocal motion. This wave one file system is manufactured with special technology of M wire, that provides strength and resistance to fatigue up to four times when compared with other NiTi files systems.[14]

There are three file available in wave one system, with three different lengths i.e. 21mm, 25 mm and 31 mm. the file with the smallest size i.e. of 21 mm is used in the fine canals, mostly in anterior regions and having a continuous taper of 6 percent with in it. The second file i.e. of 25 mm is most commonly used in majority of the canals with a taper of 8 percent that gradually reduces towards the coronal portion of the canal system. The third file is of 31 mm, this file is used in larger canals with a taper of 8 percent at the apical region, that also reduces towards the coronal portion of the canal.

The advantages of wave one file system are as follows: -

1. It has improved flexibility
2. Efficient efficiency
3. Conservation of remaining dentine at the coronal portion of the tooth.
4. Safe to use in the curved canals

The other system that uses single file system is known as reciproc. This system uses single file that too without prior use of any hand file. This system comprises three instruments in number i.e. R 25, R 40 AND R 50. This instruments of this system is also comprised of M wire, that provide adequate strength to the instruments along with greater flexibility and also provide resistance to cyclic fatigue. This reciproc system comprises of s shape cross section. This system comprises of regressive taper. This system comprises of continuous taper which is present at first 3 mm of the working instrument and after than decreasing taper towards the shaft side. The R 25 instrument is available with diameter of 0.25 mm which is present at the tip along with taper of 8 percent which is present at the tip. The second instrument known R 40 is having a diameter of 0.40 mm which is present at the tip with a 6 percent of taper present at the first 3mm from the tip and third instrument i.e. R 50, having a diameter of 0.50 mm at the tip and 5 percent taper for the first 3 mm of the tip.

This system works on cutting motion, when it moves in clock wise direction, it results in cutting of the dentine and when the instrument is moved in counter clock wise direction the instrument gets dis engaged form the cutting side.

The prime advantages of the reciproc system are as follows

1. Less time consuming
2. Less clinical steps
3. Less chances of cross contamination from the patient.
4. Maintain centering ability.

The other concept of single file system where only one file is used to clean and shape the canal of the tooth is "one shape". The instruments of one shape is made up of austenite 55-NiTi alloy, that provides the system adequate strength and flexibility and better adaptability. This system comprises of a single instrument that is having tip size of 25 and a taper of 0.06 which is constant. The instrument comprises of different cross sectional design of the entire working part.[15,16]

Advantages of one shape system are as follows

1. Only one file is used for cleaning and shaping of the canal system.
2. Very less time consuming, approximately 4 times much faster than the conventional rotary system.
3. Minimal fatigue among the instrument is seen.
4. System shows anti breakage control.

1.1. F360

Is a newer system that requires only two files for the cleaning and shaping of the canal system. This instrument shows specifically s shaped curve design along with thin instrument core which provides very fine cutting efficiency. This system is available in two different sizes namely 025 and 035. In case when there is wide root canal morphology additional sizes are available like 045 and 055. The prime advantages of this system are it flexibility of the instrument and it minimizes canal transportation.

2. Conclusion

In this busy day to day life, one should approach to these newer systems, which uses single file for the cleaning and shaping of the canal system, to save the time for both i.e. for patient and for the clinican. As these file systems offers proper cleaning of the canal and the most apical portion.

3. Conflict of Interest

The authors declare that there are no conflicts of interest in this paper.

4. Source of Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

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Cite this article: Fatima A, Shabir H, Goyal A, Gupta AS, Khan F, Sood A. A literature review of single file NiTi rotary system in endodontics. *IP Indian J Conserv Endod* 2021;6(2):85-87.