# The most effective and advanced technique of single visit Root canal in our daily practice

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**Abstract:**

*The new WaveOne NiTi file system from DENTSPLY Maillefer is a SINGLE use, SINGLE file system to shape the root canal completely from start to finish. Shaping the root canal to a continuously tapering funnel shape not only fulfils the biological requirements for adequate irrigation to free the root canal system of all bacteria, bacterial by products and pulp tissue, but also provides the perfect shape for 3-D obturation with gutta percha. WaveOne files only shape the canal, extremely quickly in many instances, but they do not clean the root canal. It is the duty of teachers, clinicians, researchers and manufacturers should emphasize the role and importance of irrigation as a major determinant of endodontic success. Once it is fully appreciated that shaping and cleaning the root canal system are irreversibly tangled, then endodontics will be easier for all and available to all, and WaveOne will truly become the root canal preparation instrument of the future .*

*There are many dental surgeons who, for whatever reason are reluctant to use NiTi rotary instruments to prepare canals, despite the recognized advantages of flexibility, less debris extrusion and maintaining canal shape, amongst other advantages. For them, the use of a single reciprocating file will be very attractive both in terms of time and cost saving.*

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**Introduction:**

Single visit endodontic means to cleaning, shaping and disinfection of a root canal system followed by obturation of the root canal at the same appointment. The concept of single visit endodontics started at least 100 years back. Initiating and completing an endodontic treatment in one appointment has always been surrounded by controversy. In addition, the majority of endodontists thought that performing treatment in this manner would cause more postoperative pain than if performed in multiple appointments. But now many studies have shown that completing the treatment in single sitting show no difference in quality of the treatment, success rate and incidence of postoperative complications. However, a growing number of dentists are practicing more and more single visit endodontics through WaveOne reciprocating endodontic system.

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**Fig.-1:** *WaveOne motor and 6:1 reducing handpiece*

**Criteria of case selection**

1. Competence of the clinician.
2. Positive patient acceptance.
3. Absence of anatomical interferences.
4. Accessibility.
5. Availability of sufficient time to complete the case.
6. Pulp status.
7. Clinical symptoms.

**Advantages of single visit Root canal**

1. Convenience- Patient does not have to tolerate the discomfort of repetitive local anaesthesia, treatment procedure and postoperative recovery.

2. Efficiency- The clinician does not have familiarize himself/herself to patient's particular anatomy or landmarks.
3. Patient comfort- Single visit is more comfortable to patient due to less number of visits and less chance of local anaesthesia.
4. Reduced intra-appointment pain- Sometimes the mid treatment visit increased caused by the leakage of the temporary cements.
5. Economics- Extra cost may be included during multiple visit both for the patient and doctor as well.
6. Minimizes the fear and anxiety- Especially for the psychological trauma and fear of dentist /dental chamber.
7. Reduces incomplete treatment- Some patients do not continue their full treatment, due to loss of pain or cannot manage time anymore. So SVE can reduce this chance of missing.
8. Lesser errors in working length- in multiple visit, a lot of errors may arise such as reference point may be lost due to coronal fracture or modification by grinding of the tooth and the actual working length may be changed.
9. Restorative consideration- Immediate placement of coronal restoration /filling ensures effective coronal seal and esthetics.

**Disadvantages of single visit endodontics**

1. It is exhausting /tiring for patients to keep their mouth open for long duration.
2. If mid-treatment flare-up [intermittent pain] happens to occur, it is easier to establish drainage in a tooth which is not obturated. In case of obturated tooth, it is difficult to remove filling material.
3. Clinician may lack the proficiency to properly treat a case in single visit.
4. Some case can't be treated by single visit. For example cases with very fine, curved, calcified, multiple canals may not be treatable in single visit. If hemorrhage or exudation occurs, it becomes difficult for the clinician to control and complete the case in single visit.

**Indications of single visit Root canal**

1. Vital teeth.
2. Fractured Anteriors where esthetics is the concern.
3. Patients who require sedation every time.
4. Non-vital teeth with sinus tract.
5. Non-surgical retreatment cases.
6. Medically compromised patients who require antibiotic prophylaxis.
7. Physically compromised patients who can't come to dental clinics frequently.

**Contraindications of single visit**

1. Teeth with anatomic anomalies such as calcified and curved canals.
2. Asymptomatic non-vital teeth with periapical pathology and no sinus tract.
3. Acute alveolar abscess cases with frank pus discharge.
4. Patients with acute apical periodontitis.
5. Symptomatic non-vital teeth and no sinus tract.
6. Patients with allergies or previous flare-ups.
7. Teeth with limited access.
8. Patients who are unable to keep mouth open for long duration such as patients with TMJ disorders.

**Advanced technology for single visit ROOTCANAL through Wave One rotary system:**

**Sizes of Waveone Single File**

1. WaveOne small file – The tip of the file is ISO 21mm with a continuous fixed taper of 6%.
2. WaveOne primary file- The tip of the file is ISO 25mm and has a continuously decreasing taper from its tip to its shaft (0.8, 0.65, 0.6, 0.55).
3. WaveOne large file- The tip of the file is ISO 40mm and has a continuously decreasing taper from the tip to the shaft (0.8, 0.65, 0.6, o.55).


**Fig..-2:** *Wave One Files*

A. Yellow band file – Small size
B. Red band file – Primary size
C. Black band file – Large size

**Selection of Waveone single file**

Whilst a good preoperative periapical radiograph will give an indication of what to expect before the canal is prepared only the first hand file into the canal will aid in the selection of the WaveOne file as follows:

1. If a 10 k-file is very resistant to movement, use WaveOne Small file.
2. If a 10 k-file moves to length easily, is loose or very loose, use WaveOne primary file.
3. If a 20 hand file or large goes to length, use WaveOne large file.
4. If a 10 k-file is very resistant to movement, use WaveOne Small file.
5. If a 10 k-file moves to length easily, is loose or very loose, use WaveOne primary file.
6. If a 20 hand file or large goes to length, use WaveOne large file.

**Procedures of Waveone single file shaping**

1. Take hand file into canal and watch-wind to length or resistance.
2. Use appropriate WaveOne file to approximately two-thirds of canal length.
3. Irrigate copiously.
4. Take hand file to length and confirm with the apex locator and radiograph.
5. Take Wave One file to length.
6. Confirm foramen diameter with hand file the same sizes Wave One file, if comfortable, preparation is complete.
7. If foramen diameter is larger than the WaveOne file, consider the next larger WaveOne file.
8. Majority of cases will be completed with WaveOne primary file.

**Clinical procedures or guidelines for the use of Waveone instruments in details**

**Guideline 1: Create straight line access**

It is important to prepare an adequate access cavity that will ensure straight line access into each root canal system after removal of all the pulp chamber contents. Ultrasonic instruments are very useful instruments to remove any pulp calcification and to refine the access cavity walls to improve straight line access. The recommended method of use is to introduce the file into the coronal portion of the root canal ensuring that the file is able to rotate freely. Restrictive dentine is then removed using a backstroke, outwards brushing motion. This step will also relocate the canal orifices more mesially and pre-flare the coronal third of the root canal.

**Guideline 2: Negotiate canals to patency and create a reproducible glide path**

The author prefers to negotiate each root canal with a size 08 or 10 k-file until apical patency is established. According to Ruddle (2012) one of the greatest challenges of endodontic treatment is the ability to find, follow and predictably secure any given canal to its terminus. Apical patency is the ability to pass small K-File 0.5-1 mm passively through the apical constriction, beyond the minor diameter without widening it.

After working length determination and radiographic confirmation, a reproducible glide path should be established. According to west a glide path is a smooth passage that extends from the glide path should be the same size as, or ideally a size bigger that the first rotary instrument that will be introduced into the root canal system.

**Guideline 3: Enlarge the glide path**

It is recommended to enlarge the glide path to either a size 15 K file manually or by using rotary pathFiles of ISO 19.

PathFile NiTi rotatary files were introduced to the market in 2009 specifically for the purpose of glide path preparation. The system consists of three instruments which are available in 21mm, 25mm, and 31mm lengths. They have a square cross section and a 2 percent taper, which makes them resistant to cyclic fatigue, ensures flexibility and improves cutting efficiency. The tip angle is 50 degrees and is non-cutting, which reduces the risk of ledge formation.

Pathfile NO.1[purple] has an ISO 13 tip size, PathFile NO.2 [white] has an ISO 16 tip size and PathFile NO.3 [yellow] has an ISO 19 tip size facilitates progression of the files. The manufacturer suggests using the PathFile No.1 only after a size 10 k-file has been used to explore the root canal to working length.

The advantages of using NiTi rotary instruments for glide path preparation are-reduced canal preparation time, reduced canal aberration [ledges, zips and apical transportation] with improved maintenance of originial anatomy, reduced apical extrusion of debris and post operative pain, less operator and hard fatigue.

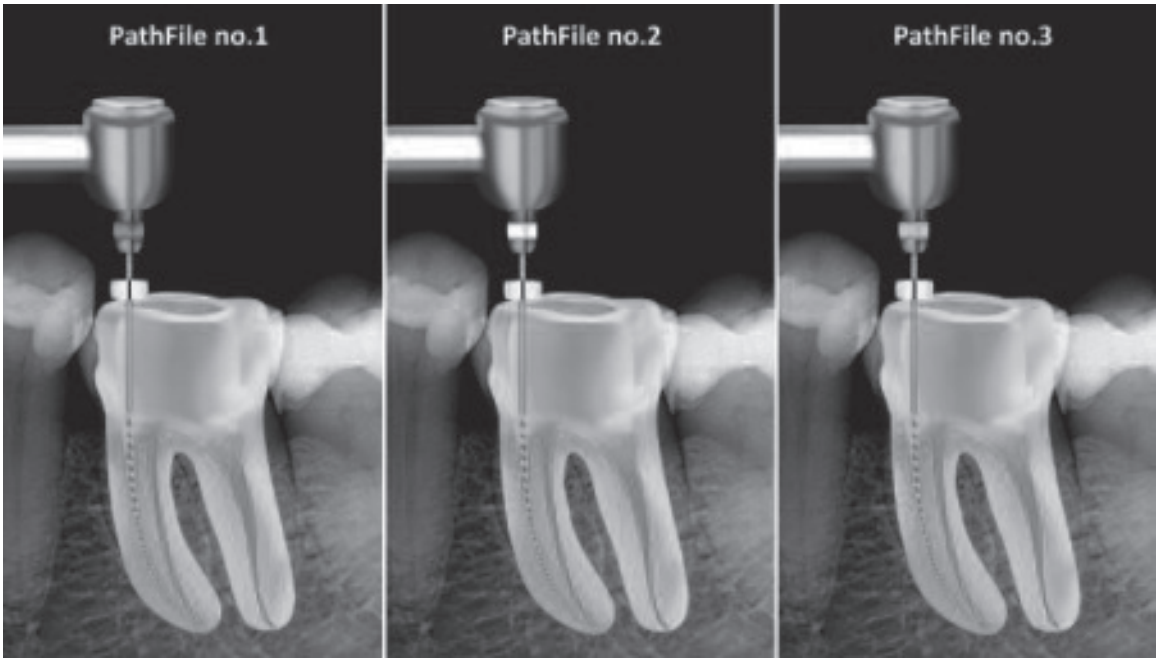



**Fig.-3:** *PathFiles no. 1, 2 and 3 are taken in rotary motion gradually to full working length to enlarge the glide path.*

**Guideline 4: Select the correct WaveOne file**

The following guidelines can be used for WaveOne file selection after a reproducible glide path of size ISO 15-19 [hand or PathFiles] has been established.

a. WaveOne Small File [21/06, yellow ring]
   i. Canals with severe curvatures in the apical parts of the root canal system.
   ii. Very long root canals.
   iii. Very narrow and complex mesio-palatal canals on upper molars.

b. WaveOne Primary File[25/08, red ring]
   i. Majority of root canals [average length, moderate curvatures in midroot and apical parts.]

c. If the first instrument to working length is a size 25 or larger it is recommended to ues the WaveOne large file [40/08, black ring]

This file is mainly indicated for larger diameter and relatively straight root canals.

**Guideline 5: Canal preparations**

Preparation is done with a progressive inward (light apical directed force) and outward circumferential brushing motion with the WaveOne instrument of choice in 3mm cycles (root canal must be filled with irrigation solution of choice)

A controlled and disciplined way to ensure a cutting cycle of 3mm at a time, is to insert the instrument into the root canal [after glide path enlargement] and record the initial depth of file penetration by adjusting the rubber stop to that reference point on the cusp tip of the tooth. Remove the instrument from the root canal and record the length. Move the rubber stop to a working length of 3mm longer than the initial recorded length. The objective with the first cutting cycle will be to only cut with the instrument until the rubber stop reaches the cusp reference point, thereby ensuring that a maximum of 3mm of cutting is achieved before the file is removed to clean the debris from the cutting flutes and from the root canal.

**Guideline 6: Clean the cutting flutes of the instrument after each cycle**

The flutes of the instruments collect cutting debris very quickly because most of the work is done with a single instrument. Failure to clean the flutes of the instrument and the cutting debris from the root canal regularly will result in a decrease in cutting efficiency, resulting in the operator exerting more apical pressure on the instrument with a higher risk of possible file fracture.

**Guideline 7: Irrigate and recapitulate the root canal system after each cutting cycle**

Before the next cutting cycle, the debris from the root canal system must be removed and the clinician must ensure that the glide path is still reproducible and the canal is patient. This is achieved by placing irrigation solution[Copious irrigation with 5% NaOCl and EDTA] into the root canal followed by inserting a 08 or 10 k-file to full working length, using a watch-winding motion [recapitulation], followed by a final irrigation step. The objective of recapitulation is to loosen up any compacted debris and move it back into the irrigation solution before it is flushed out of the canal. The root canal and the instrument are now ready for the next cutting cycle.

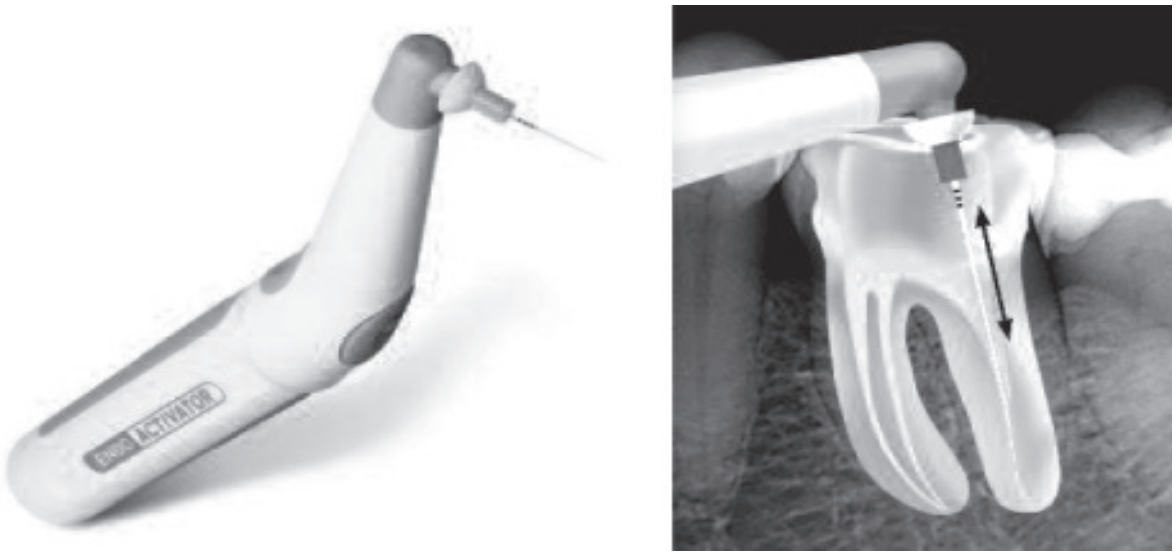



**Fig.-4:** *The EndoActivetor and irrigating the prepared root canals.*

**Guideline 8: Easy and faster biomechanical preparations**

Faster preparation time necessitates longer irrigation times preferably with activation of irrigation solution. Chemo-mechanical debridement that allows elimination of pulpal tissue, microbiota and their by-products, and organic and inorganic debris removal by using mechanical instruments and intracanal irrigation solutions is one of the most important objectives of endodontic treatment.According to Dunavalant et al [2006], sodium hypochlorite along with the use of ethylenediamine-tetraacetic acid [EDTA] is able to achieve the goal of chemical debridement.

There is increasing evidence to support that the activation of fluid in well-shaped root canals can play a strategic role in the debridement and disinfection into al aspects of root canal systems, including dentinal tubules, lateral canals, fins, webs and anastomoses. The author would suggest to use the EndoActivator [Dentsply/Maillerfer] to activate irrigation solutions after root canal preparation with the WaveOne reciprocating instruments.

The EndoActivator [Dentsply/Maillerfer] is a sonically driven root canal irrigation activation device. It consists of a battery operated portable hand piece and different sizes of disposable, strong, flexible polymer tips. Sonically vibrating the polymer tip, in combination with moving the tip up and down in a short vertical stroke, synergistically produces a powerful hydrodynamic phenomenon. According to Caron [2007] this activation technique is capable to clean debris from lateral canals, remove the smear layer, and dislodge clumps of stimulated biofilm within curved canals of molar teeth.

**Guideline 9: Guildlines for obturation**

Some articles recommend that the final shape can be confirmed when the apical flutes of the final shape can be

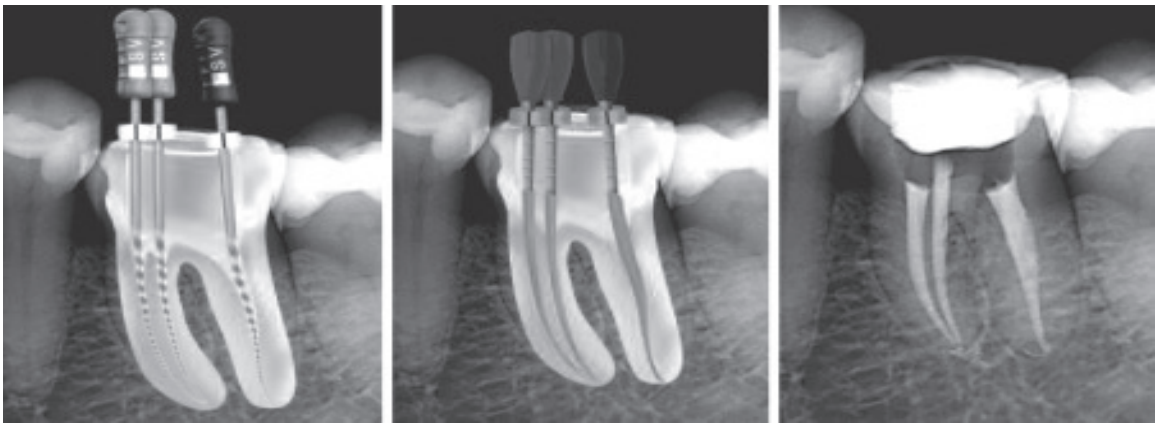
**Fig.-5:** *WaveOne matching paper points*

**Fig.-6:** *WaveOne matching gutta-percha points*

**Fig.-7:** *WaveOne matching Thermafil obturators*

confirmed when the apical flutes of the instrument are loaded with dentin debris. However, in the author's clinical experience this is not always a reliable method although it can be used as a guideline.

Gauging the apical foramen with a corresponding NiTi hand file is another alternative. For example, if the final canal preparation was done with a primary WaveOne 25/



8 (a) 8 (b) 8 (c)

**Fig.-8:** *(a). GuttaCore NiTi varifiers are used to verify the final canal shape. 8 (b). GuttaCore /guttapercha obturators used for root canal obturation. 8 (c). Final radiography result after root canal obturation.*

08 instrument a size 25/02 NiTi hand file is fitted into the prepared canal. If the tip of the file is snug at length the final shape is confirmed and a matching WaveOne Primary Gutta-percha Point [Dentsply/Maillefer] is used for obturation.

**Conclusion:**

The WaveOne system is an exciting new concept in the preparation of the single visit root canal. Whilst current teaching advocates the use of multiple NiTi files of different diameter and taper to gradually enlarge the root canal, only one WaveOne single shaping file is required to prepare the canal to an adequate size and taper, even in narrow and curved canals.

WaveOne files only shape the canal , extremely quickly in many instances, but they do not clean the root canal. It is the duty of teachers, clinicians and manufacturers to emphaisise the role and importance of irrigation as a major determinant of endodontic success. Once it is fully appreciated that shaping and cleaning the root canal system are irrevocably intertwined, then endodontics will be easier for all and available for all.

Drs Julian Webber, Pierre Machtou, Wilhem Pertot, Sergio Kuttler, Clifford Ruddle and John West where involved in the development, field testing and research associated with WaveOne.

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