

XP endoshaper, a new era in Rotary Endodontics- a review

Running title: XP endoshaper- a review

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ABSTRACT: *Clinical research continues to concentrate on improving drainage, developing new alloys for instruments, and developing new sealers to clean, shape, and obturate the oval root canal in three dimensions (3D). This article examines the effectiveness of the MaxWire technology instruments XP EndoShaper, Finisher, and XP Endo Retreatment file in 3D cleaning and forming, biofilm removal, triple antibiotic paste removal, as well as debris and smear layer removal.*

Keywords: *MaxWire, oval canal, XP Endo file*

1. INTRODUCTION

The primary aim of any endodontic procedure is to restore the root canal's original anatomy while also eliminating microorganisms such as those present in contaminated root canals, as well as debris and smear layers that harbour microorganisms and their by-products. Bacteria that are still present in the root dentine or periradicular tissues should be removed to enhance the prognosis, and this should be accomplished without causing tissue damage.^[1,2,3] Despite the use of various instrumental techniques, only 30–40% of root canal surfaces are clean, leaving the rest untouched. This is caused by a smear layer that prevents intracanal disinfectants and sealers from penetrating into the dentinal tubules, resulting in canal failure. Sodium hypochlorite, deproteinizing agents, ethylenediaminetetraacetic acid, calcium-chelating agents, traditional syringe irrigation process and endoactivator device are some of the irrigation solutions that have been implemented to reduce residual debris, necrotic tissues, bacteria and for removal of the smear layer that are produced by mechanical instrumentation in the root canal system.

As a result, this article addresses the newer generation file (XP Endo), which was introduced by the company "Flückiger & Huguenin (FKG Dentaire SA), Switzerland " with latest MaxWire technology. Debris and smear layer removal is more successful with XP Endo Shaper (XPES) and Finisher (XPEF) introduced in the year 2015. They make irrigation simpler and effective in removing the biofilm from both the main canal and the deep, narrow apical groove.

The most concerning problem for all rotary instruments is the possibility of fracture. To overcome the fracture of rotary instruments, FKG Dentaire SA, La Chaux-de-Fonds,

Switzerland, launched the newer generation XPES and Finisher. By heating the alloy during the manufacturing process, new nickel–titanium (Ni-Ti) forms have been produced, resulting in a combination of heat treatment and hardening, increasing the versatility of Ni–Ti instruments.^[4] Its form enables root canal instrumentation in a three dimensional (3D) pattern into the complex root canal morphologies. A snake-shaped rotary Ni-Ti instrument design is used by XPES with an initial taper of 0.01.

According to the maker, XP places minimal stress on dentin walls, lowering the risk of microcracks. It adapts well to the canal anomalies, has a high cyclic fatigue tolerance with enhanced smear layer removal from the walls. MaxWire, an FKG-patented alloy, is used to build the instrument (Martensite-Austenite Electropolish -Flex, FKG Dentaire).

2.XPENDOFINISHER

In 2015, FKG released the XPEF file. After root canal preparation to size #25, it's recommended to use it at 800 rpm and 1.0 Newton Torque with irrigating solution. The diameter of the instrument is ISO #0.25 with a taper of 0. Bao et al, found that the XPEF file would help extract biofilm from both the main canal and the deep, narrow apical groove in 2017. In 2017, Keskin et al, tested the XPEF file's efficacy in extracting calcium hydroxide from a simulated internal resorption cavity. XPEF's file-cleaning capabilities have been compared to Passive Ultrasonic Irrigation in a number of studies.^[5,6] The Vibringe syringe (Vibringe B. V. Corp, Amsterdam, Netherlands) and Photon-Initiated Photoacoustic Streaming (PIPS) were used to remove calcium hydroxide and antibiotic dressing pastes, as well as biofilm from the canals. It has proved to be the most successful in almost every scenario.

Elnaghy et al, published a comparative report on the usefulness of the XPEF file in 2016. As compared to Endo Activator in curved root canals, they discovered that XPEF file is equally successful in removing smear layer and debris. In 2016, Azim et al, and Alves et al, conducted a comparative study of the capacity to disturb biofilm between the XPEF file and the new generation Ni-Ti instruments, and found that the latter still left a portion of bacteria unremoved in statistically significant values. Following XPES, the XP Endo Finisher file (XPEF) can be used with standard Ni-Ti files for root canal planning.^[7] The XPEF file is used for final cleaning procedures.

3.XPENDOSHAPER

For 3D canal shaping, FKG introduced the XPES file in 2016. This instrument is also made of MaxWire steel, with a 4% taper and an ISO #30 apex. The instrument's anatomy is unique; it's a classic conical instrument that impresses its form in the canal, but it has waves flowing through it that, during expansive rotation, affect the canal surface in the best way possible (Adaptive Core Technology).XPES has six cutting blades for optimal file guidance in the canal; the tip diameter ranges from #0.15 to #0.30. The instrument returns to form when used at body temperature (800 rpm), and its excellent versatility allows it to cover taper up to 8% and canal diameter up to #0.90. There would be a 1% taper. This file is in M phase below 35°C and remains in an austenitic phase above 35°C. The tip has a taper of 0.02–0.08 on a scale of #30–#90. It operates at a minimum torque of 1 Nw, reducing the chance of a dentin split.^[8,9,10]

When compared to FlexMaster (VDW GmbH, Munich, Germany), ProFile Vortex Blue Dentsply Tulsa Dental Passive Ultrasonic Irrigation (PUI), and True Shape (Dentsply-Tulsa),

XPES is more fragile in torsional tests due to its own design of the file; it does not work to engage the canal wall.^[11,12]

4.XPENDOFINISHER-R

The XP-Endo Finisher-RTM, launched in 2017 is dedicated to endodontic retreatment (XPEF-R).^[13]The XPEF-R has a greater diameter and a stronger core than the XPEF. It exhibits superior efficacy in Gutta-percha cleaning and removal. The XPEF-R file greatly enhances the removal of AH Plus sealer, according to Taxiarchis G, Kontogiannis et al, in 2019.^[14,15]

5. CONCLUSION

Medical knowledge and studies suggest that there is still no ideal procedure for conducting endodontic therapy, and no universal instrument that can clean the entire root canal. Recent technology, such as the XP-Endo device, has allowed endodontists to make significant progress in reducing the risk of endodontic treatment failure and increasing the percentage of long term success. To confirm the effectiveness of this new file system, further research is needed.

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