The ONE

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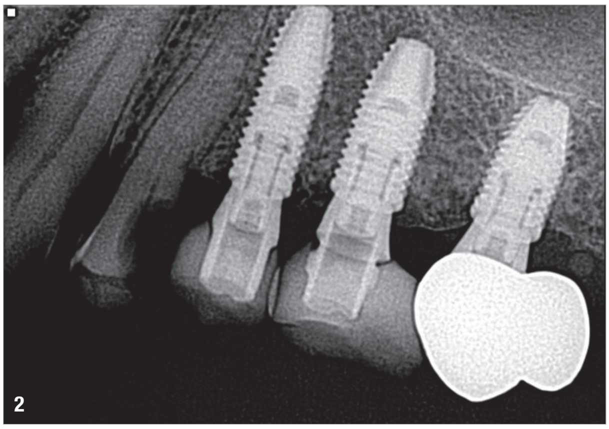
Fig. 1: ZenFlex ONE reciprocating file system.

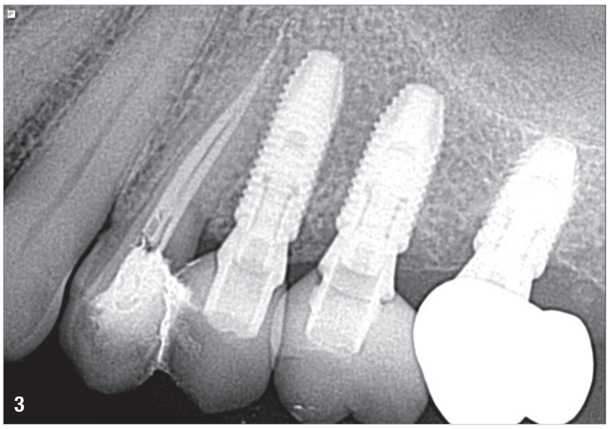
Introduction

In 1985, Dr James Roane introduced the balanced force concept for shaping curved canals using manual files.[1] This principle focuses on neutralising the various stress vectors generated during instrumentation. The vectors arise primarily from two sources: the rotating and cutting motion of the file, which generates stress dependent on the file's geometry and specifically the cutting edge, and the resistance of the dentine, which creates an opposing force. The magnitude of this resistance depends on the quality of the dentine and the canal size and shape. The greater the root canal curve, the higher the resistance will be. Effective shaping of a curved canal while preserving its natural anatomy requires balancing these two main forces.

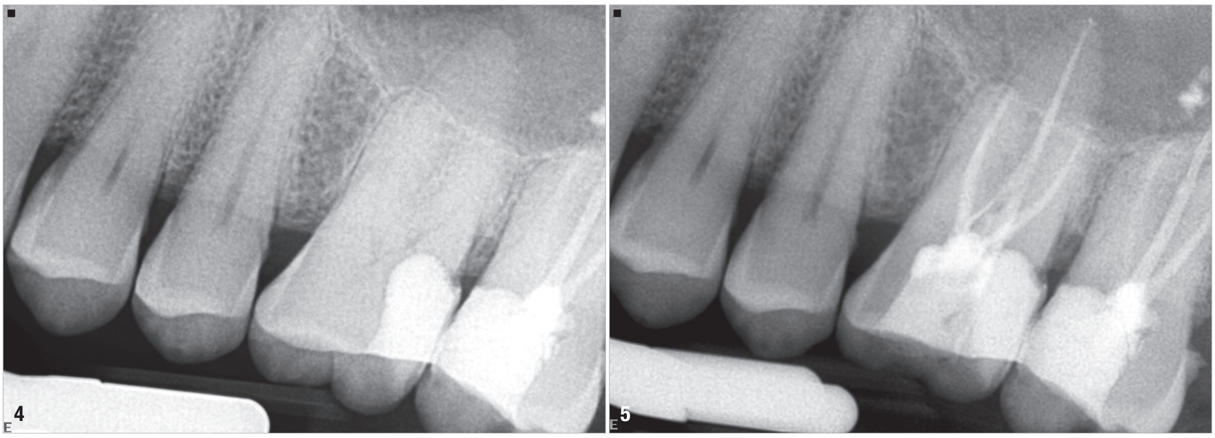
In modern endodontics, nickel–titanium (NiTi) rotary files revolutionised the field, and reciprocating motion was developed for their use in order to lower the torsional stress on the file by controlling the angle of rotation. Because the file does not make a full rotation, the risk of file separation is lower. Several studies have reported the benefits of this file motion with the use of a single-file or two-file technique. Others have reported that this motion can cause the file to push debris in front of it, tending to extrude debris outside of the canal space and thus creating problems in the apical area. This concern was taken into consideration when designing a new reciprocating file system, ZenFlex ONE (Kerr Dental; Fig. 1), seeking to balance the cutting efficiency and debris removal, known as the rake angle and coefficient balance. The flutes of ZenFlex ONE are reversed, allowing it to be used in reciprocating motion. The cutting edge of the file is very sharp, reducing the stress that arises from the shaping of the canal. The file has a unique design, achieving very efficient debris removal and directing most of the debris coronally.

Some papers have found that using reciprocation with a single-file technique has the tendency to create a squeezing effect by pushing the file inside the canal, creating microcracks, but others have stated the contrary. These conflicting findings were also taken into consideration in the design of ZenFlex ONE. A novel variable-heat treatment gives the file a unique shaping capacity with its strong cutting tip and lowers the stress between the file and canal at the curve, as the middle part of the file is very flexible and can adapt to stress. In this manner, less stress is placed on the canal walls, minimising the risk of microcracks. The debris produced during canal preparation can create additional stress, and this is influenced by the quality of the NiTi alloy. If the alloy is softer, the stress





Case 1—Fig. 2: Initial periapical radiograph. **Fig. 3:** Post-op periapical radiograph.



Case 2—Fig. 4: Initial periapical radiograph. **Fig. 5:** Post-op periapical radiograph.

generated by the file passing through the curve will be lower because the file is more flexible.

In this article, I present four clinical cases in which I used ZenFlex ONE. In treating these cases, I did not combine the file system with the Traverse rotary glide path file (also Kerr Dental) and ZenFlex rotary files as recommended by the company.

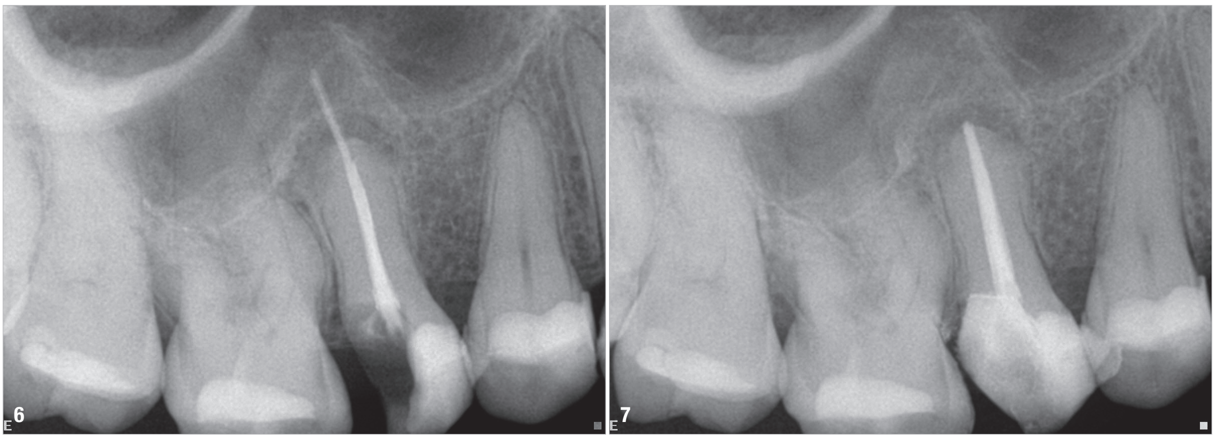
Case 1

The single-file technique using a 25/.06 file is a common technique, the idea being to use one file to shape the canals in several passes. This first case was a maxillary premolar requiring a straight-forward root canal treatment. The patient had lost many teeth and wanted to save this one. The 25/.06 ZenFlex ONE file was the file of choice, as the canals were not calcified or very narrow. The file should be used for 3–4 seconds in reciprocating motion and then removed from the canal. An irrigation sequence should then be performed, using EDTA and the file used again for another 3–4 seconds. A gentle push-and-pull movement can help the file to advance. This sequence is repeated until the working length is reached. The working length is measured either at the beginning or preferably after the first shaping sequence. A 25/.06 ZenFlex ONE gutta-percha point was adapted to the working length, followed by warm vertical compaction using the elements IC and Pulp Canal Sealer (both Kerr Dental; Figs. 2 & 3).

Case 2

In some cases where the canal is narrow or presents an unusual anatomy, for example multiple curvatures, I recommend the use of the 20/.06 ZenFlex ONE file before using the 25/.06 ZenFlex ONE file. The same applies for preparing the second mesiobuccal canal in maxillary molars. I use the 20/.06 file all the way to working length with the same pattern of 3–4 seconds of shaping and irrigation between the cycles, followed by the 25/.06 file all the way to the working length.

In this case, the mesiobuccal canal was challenging, as it merged with the palatal canal. The palatal root was completely calcified at the orifice (Fig. 4). An ultrasonic tip was used in order to search for the orifice, following the colours of the access cavity. A tip: when searching for a completely calcified canal, fill the access cavity with sterile water, and bubbles from the floor of the access cavity indicate the location of the canal. I used the 20/.06 file



Case 3—Fig. 6: Initial periapical radiograph. **Fig. 7:** Post-op periapical radiograph.

Case 4—Fig. 8: Initial periapical radiograph. **Fig. 9:** Preparing the access cavity and removing the internal core build-up using an ultrasonic tip. **Fig. 10:** Removing the old gutta-percha. **Fig. 11:** Post-op periapical radiograph.

to prepare the canal, followed by the 25/.06 file. A 25/.06 gutta-percha point was adapted, followed by 3D warm obturation with Pulp Canal Sealer (Fig. 5).

Case 3

ZenFlex ONE can also be used in retreatment. The main file used in retreatment is the 25/.06 file. I prefer not to use any solvent to remove the gutta-percha. In this particular case, it was very important not to create additional forces that would push the gutta-percha further out of the canal, so the file was not taken all the way to full working length. I used the file to create a space between the gutta-percha and dentine wall and then used a large manual H-type file and rotated it inside the canal to grab the gutta-percha point and pull it out. The 35/.06 ZenFlex ONE file was used to finish the shaping because the canal was large enough, an irrigation sequence was carried out and a master point was adapted, followed by 3D obturation (Figs. 6 & 7).

Case 4

Endodontic retreatment can be challenging, especially when performed on maxillary molars. The patient presented with a symptomatic tooth, and on the preoperative periapical radiograph, we could see that an inadequate root treatment had been performed (Fig. 8). The access cavity was prepared and an ultrasonic tip used to remove the internal core build-up that had been placed (Fig. 9). Retreatment was initiated with the 35/.06 ZenFlex ONE file, and as soon as I started to remove the gutta-percha, purulent exudate began emerging from the canals (Fig. 10). I next used the 25/.06 file. The built-in apex locator was activated once I had reached the working length—a great feature, especially in order to avoid over-preparation when performing a retreatment and since I was working close to the sinus. I finished the preparation using the 35/.06 file all the way to working length, adapted a 35/.06 gutta-percha point and performed 3D obturation (Fig. 11).

Conclusion

The evolution of endodontic techniques and instrument designs has significantly enhanced the ability of clinicians to perform root canal treatments with precision and efficiency. The ZenFlex ONE system exemplifies these advancements, offering a tailored reciprocating motion that balances cutting efficiency with debris removal while minimising stress on canal walls and the risk of file separation.

The clinical cases presented highlight the versatility of the ZenFlex ONE file system across various scenarios, including primary treatments and complex retreatments. Its innovative design, featuring a strong cutting tip and a flexible middle section due to variable-heat treatment, ensures adaptability to diverse canal anatomies. Additionally, the efficient debris removal system and sharp cutting edge contribute to its reliable performance while reducing the potential for complications, such as micro-cracks or apical extrusion of debris.

These features underscore the importance of employing modern tools like ZenFlex ONE to achieve predictable and reproducible outcomes in endodontic procedures. As clinical challenges continue to evolve, the integration of advanced file systems and evidence-based techniques will remain central to delivering optimal patient care and preserving the integrity of the root canal system.

Reference

1. Roane JB, Sabala CL, Duncanson MG Jr. The "balanced force" concept for instrumentation of curved canals. J Endod. 1985 May;11(5):203–11. doi: 10.1016/S0099-2399(85)80061-3.

about

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