**RECIPROC blue: The new generation of reciprocation**

Dr Ghassan Yared, Canada

**The use of mechanical instruments** in reciprocation with unequal forward and reverse rotation was introduced in 2008.¹ The RECIPROC series of instruments (VDW) were designed specifically for this type of motion.² RECIPROC blue, a thermally treated nickel-titanium instrument, is an improved version of the original RECIPROC.³ It has increased resistance to cyclic fatigue and greater flexibility.⁴

The present article describes the use of RECIPROC blue instruments for canal preparation without any prior instrumentation and without a glide path. Only one instrument is needed to enlarge the majority of canals to an adequate size and taper regardless of the size of the canal and the degree of canal curvature or canal calcification. Similar to the original RECIPROC series, the RECIPROC blue system includes three instruments, RECIPROC blue 25, RECIPROC blue 40 and RECIPROC blue 50, matching paper points, matching gutta-percha cones, and matching gutta-percha obturators (GUTTA-FUSION) (Figs. 1a–d). The RECIPROC blue instruments have an S-shaped cross section (Fig. 2). The three instruments have a regressive taper starting at 3 mm from the tip. RECIPROC blue 25 has a diameter of 0.25 mm at the tip and an 8% (0.08 mm/mm) taper over the first 3.0 mm from the tip. RECIPROC blue 40 has a diameter of 0.40 mm at the tip and a 6% (0.06 mm/mm) taper over the first 3.0 mm from the tip. RECIPROC blue 50 has a diameter of 0.50 mm at the tip and a 5% (0.05 mm/mm) taper over the first 3.0 mm from the tip.

The instruments are used in conjunction with a motor (Figs. 3a, b) at ten cycles of reciprocation per second. The motor is pro-
grammed with the angles of reciprocation and speed for the three instruments. The values of the forward and reverse rotation are different. When the instrument rotates in the cutting direction (forward rotation), it will advance in the canal and engage dentine to cut it. When it rotates in the opposite direction (reverse rotation; smaller than the forward rotation), the instrument will be immediately disengaged. The end result, related to the forward and reverse rotation, is an advancement of the instrument in the canal. The angles set on the reciprocating motor are specific to the RECIPROC blue instruments. They were determined using the torsional properties of the instruments.

**Technique**

The technique is simple. In the majority of canals, only one RECIPROC blue instrument is used in reciprocation to complete the canal preparation without the need for hand filing or creating a glide path. The requirements for the access cavity and the straight-line access to the canals, and the irrigation protocols remain unchanged. The use of drills or orifice openers is not required prior to starting the canal preparation with the RECIPROC blue instrument.

The selection of the appropriate RECIPROC blue instrument is based on an adequate radiograph just as shown on graphics (Fig. 4). If the canal is partially or completely invisible on the radiograph, the canal is considered narrow and RECIPROC blue 25 is selected (Figs. 5a–c). In cases where the radiograph shows the canal clearly from the access cavity to the apex, the canal is considered relatively large (Figs. 6a–c). A size 30 hand instrument is inserted passively to the working length (verified with an apex locator) with a gentle watch-winding movement, but without a filing action. If the file reaches the working length, the canal is considered large, and RECIPROC blue 50 is selected for the canal preparation. If the size 30 hand file does not reach the working length passively, a size 20 hand file is inserted passively in the canal. If it reaches the working length, then the canal is considered medium in size and a RECIPROC blue 40 instrument is used for the canal preparation. If the size 20 hand file does not reach the working length passively, RECIPROC blue 25 is selected.

Before commencing preparation, the length of the root canal is estimated with the help of an adequately exposed and angulated preoperative radiograph. The silicone stopper on the instrument is set at two-thirds of that length. RECIPROC blue is introduced into the canal with a slow in and out pecking motion without pulling the instrument completely out of the canal. The amplitude of the in and out movements (pecks) should not exceed 3–4 mm. With this flexible instrument, only very light pressure should be applied. The instrument will advance easily in the canal in an apical direction and should not be forced forward. After three pecks, or if resistance is encountered before the three pecks are completed, the instrument is pulled out of the canal to clean the flutes. A size 10 hand file is used to check patency to two-thirds of the estimated length. The canal is copiously irrigated. The RECIPROC blue instru-
ment is then reused in the same manner until it reaches two-thirds of the estimated length. The canal is irrigated and a size 10 file is used to determine the working length with the aid of an apex locator and a radiograph. After that, RECIPROC blue is used as described until it reaches the working length. As soon as the working length has been reached, the instrument is withdrawn from the canal to avoid unnecessary over-enlargement. The RECIPROC blue instrument can also be used with a brushing motion against the walls of wide canals.

With continuous rotation, it is necessary to create a glide path in order to minimise instrument binding and the risk of fracture.\(^5\,^6\) Binding is less likely to occur when an instrument is used in reciprocation with unequal forward and reverse angles and with the limited in and out movements as described earlier. Therefore, a glide path is not required in the majority of canals when instruments are used in this manner. It has been shown the incidence of fracture of instruments used in reciprocation with unequal forward and reverse angles and with a pecking motion is very low\(^7\,^8\) in comparison with rotary instruments. However, just as with any continuous rotary system, it is possible to use the RECIPROC blue instruments after creating a glide path with, for example, R-PILOT (VDW; Fig. 7), a new reciprocating instrument specifically designed for this purpose.

A glide path should be created with R-PILOT prior to using RECIPROC blue in some canals, or for example when the RECIPROC blue instrument stops advancing in the canal or if advancement becomes difficult. In such a canal, apical pressure should not be exerted on the RECIPROC blue file. The instrument should be removed from the canal and the canal should be irrigated. Patency is then established to the working length with a size 8 file and the R-PILOT instrument is used to create a glide path to the working length. The RECIPROC blue instrument can then be used safely to the working length. The R-PILOT instrument is used with the same reciprocating motor and settings, with a light and short pecking motion similar to the use of RECIPROC blue. A glide path can also be created with R-PILOT to reduce the stresses on the RECIPROC blue instruments, for example in canals with difficult access or canals presenting with a curvature in their coronal thirds (Fig. 8).

Access to the orifices of some canals, such as the mesiobuccal orifice of a mandibular second molar, may be difficult. Owing to the thermal treatment of the RECIPROC blue files, it is safe to gently pre-curve their tips in order to make the access to these orifices easier. If an increased apical enlargement is required, a larger RECIPROC blue instrument or a nickel-titanium hand or rotary instrument can be used.

In conclusion, the use of instruments in reciprocation with unequal forward and reverse rotation and with a limited pecking motion has been shown to be very safe.\(^7\,^8\) The introduction of the RECIPROC blue instruments with enhanced physical properties\(^4\) makes the procedure even safer with respect to instrument fracture and maintenance of canal curvature (internal evaluation; Figs. 9a–c).

Editorial note: A list of references is available from the publisher.

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**Dr Ghassan Yared** is an endodontist practising in Guelph and Waterloo in Ontario in Canada. He has been extensively involved in teaching. He joined the Department of Endodontics at the University of Toronto in Canada in 1999 for a full-time position as assistant head and director of the endodontic undergraduate programme. He remained in this role as an associate professor until summer 2004. Dr Yared is an internationally recognized educator, focusing on clinical interdisciplinary endodontics and reviewer for several international scientific magazines. He is also a Fellow of the Royal College of Dentists of Canada, and a member of the Canadian Academy of Endodontology and the American Association of Endodontists.