Should I Create Glide Path With Wave-one Single File Reciprocating System ?

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Abstract

Introduction : This study evaluated the importance of creating glide path with wave-one primary reciprocating files.

Methods: Thirty ISO 15, 0.02 taper J shaped Endo Training Blocks were used. The working length was established manually and canal patency was checked with No. 10 K file. The blocks were divided into 2 groups with 15 samples each. In group 1, Path File 1, 2, and 3 were used at working length to establish a glide path, whereas in group 2, no path files were used. In both groups, canals were shaped with WaveOne Primary reciprocating files at working length. Preinstrumentation and postinstrumentation digital images were superimposed and processed. Data were analyzed using mean, standard deviation, one way ANOVA ($p<0.05$) and t-test.

Results: One way ANOVA shows there was a significant difference between wave one with glide path and wave one without glide path at 5% level of significance $p<0.05$ using t-test (Correlation test).

Conclusions: The creation of glide path before using new WaveOne nickel-titanium single-file system significantly reduced the canal modifications.

Key Words: Glide path, nickel-titanium, pathfile, reciprocating motion, WaveOne.

Introduction

Engine-driven nickel-titanium (Ni-Ti) rotary instruments are in common usage. Fracture of rotary Ni-Ti engine instruments may occur for two different reasons: because of torsion, or because of fatigue through flexure[1]. Various factors have been associated with the fracture of Ni-Ti rotary instruments: rotational speed[4-6], angle and radius of curvature[4], instrument design and instrumentation technique[7], torque[8], and operator experience[9].

The new WaveOne NiTi single-file system has been recently introduced by Dentsply Maillefer. The system is designed to be used with a dedicated reciprocating motion motor. The reciprocating motion might decrease the impact of cyclic fatigue on NiTi rotary instrument, compared with rotational motion[10,11]. It consists of 3 single-use files: small (ISO 21 tip and 6% taper) for fine canals; primary (ISO 25 tip and 8% taper) for the majority of canals; and large (ISO 40 and 8% taper) for large canals. The files are manufactured with M-Wire NiTi alloy[12].

Materials and Methods

Thirty ISO 15, 0.02 taper J shaped Endo Training Blocks (Dentsply Maillefer, Ballaigues, Switzerland) were used. Each simulated canal was colored with ink injected with a syringe (Fig 1). Each specimen was then mounted on a stable support consisting of a rectangular slot the size of the specimen (30 x10 mm) and a support for a digital camera (Nikon D70, Tokyo, Japan), positioned centrally and at 90^0 to the specimen. Digital images of all specimens before instrumentation were obtained and saved as jpeg format files. Specimens were then randomly assigned to 2 different groups (n = 15).

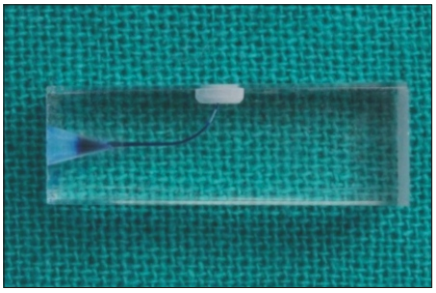

Fig. 1: Canal Injected with Ink

In group 1, the mechanical glide path was performed by using Glyde (Dentsply Maillefer) as a lubricating agent, with NiTi rotary instruments PathFile (PF) (Dentsply Maillefer). The system consists of 3 instruments with 21-, 25-, and 31-mm length and 0.02 taper; they have square section. PF #1 (purple) has an ISO 13 tip size; PF #2 (white) has an ISO 16 tip size; and PF #3 (yellow) has an ISO 19 tip size. PF #1 was used immediately after #10 hand K-file had been used to scout the root canal to full WL by using an endodontic engine (X-Smart Plus; Dentsply Maillefer) with 16:1 contra angle at the suggested setting (300 rpm on display, 5 Ncm) at full WL; then PF #2 and PF #3 were used at WL. Each canal was then shaped with WaveOne Primary reciprocating files (Dentsply Maillefer), used with a pecking motion, until reaching full WL. The WaveOne dedicated reciprocating motor(X SMART PLUS) was used with the manufacturer configuration set-up.

In group 2, glide path was not performed. Each canal was shaped with WaveOne Primary reciprocating files, used with a pecking motion until reaching full WL, by using Glyde as lubricating agent. After instrumentation, all specimens in each group were repositioned in the slot and photographed.

By using digital imaging software (Corel draw Graphic Suite X5 (Corel Corporation, Ottawa, Canada), Adobe Photoshop CS3 (Adobe Systems Inc, San Jose, CA) & Solid works student Edition software (Dassault Systems Solid Works Corp, S.A., Velizy, France) the pre & postinstrumentation images were processed and superimposed. (Fig. 2, Fig. 3)

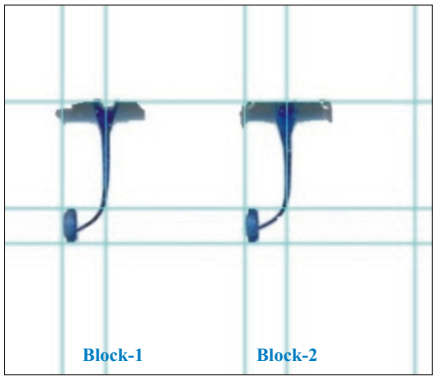

Fig. 2 : Alignment

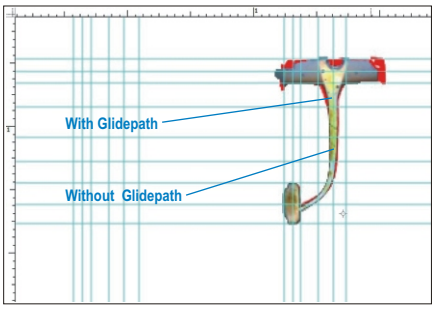

Fig. 3 : Superimposition

One way ANOVA shows there was a significant difference between wave one with glide path and wave one without glide path at 5% level of significance when $p<0.05$ using t-test (Correlation test).

S.N.	Wave-One	Mean ± s.d.	S.E.M.
01.	Without glide path	45.67±.77	0.198
02.	With glide path	46.7±1.37	0.354

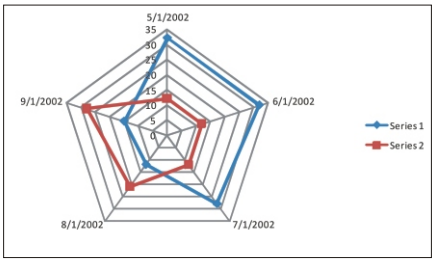

Fig. 4: Angle of Curvature for Without & with Glide Path

Discussion

In this study, a quantitative analysis was performed through observation of changes between preinstrumentation and postinstrumentation curvature. The new WaveOne NiTi primary reciprocating file, if used after a previous glide path, produced less modification in canal curvature compared with the WaveOne alone, as actually suggested by the clinical procedure flowchart[14]. WaveOne NiTi files appear to maintain the original canal anatomy, and the presence of a glide path of the canal further improves their performance. In this study, it was observed that fewer pecking motions were needed to reach full WL with WaveOne single files, when previously glide path was performed. It might be hypothesized that this could reduce the risk of excessive undesired instrument brushing on the canal walls and subsequent root canal transportation[15-19]. In this study the absence of a previous glide path affected the performance of WaveOne NiTi files, which evidenced greater alteration of the canal curvature, compared with the performance of WaveOne files with previous glide path. These findings suggest the clinical implication of root canal anatomy maintenance in susceptible anatomies. Excessive coronal flaring was found to increase the risk of strip perforation on the concave aspect of the curved roots[20]. Within the limits of our study, it is possible to conclude that the creation of a previous glidepath before any reciprocating motion instrumentation appears to be appropriate for safely shaping the canal.

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