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Evaluation of canal centering ability after preparation with f6 Sky Taper single continuous file systems with or without glide path files

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Abstract
The aim of the study was to evaluate the centering ability of F6 Sky Taper file systems with or without use of glide path files in mesial roots of mandibular first molars.
Methods: Sixty freshly extracted mandibular molars were used for the study. A muffle-block was constructed as given by Aviad *et al*. [8] Photographs were taken of all three cross-sections of each tooth using a DSLR Camera (Nikon Digital, Tokyo, Japan) at a fixed position. The specimens were randomly divided into the following three groups: Group l: Canals prepared using F6 Sky Taper file. Group 2: Canals prepared using Path Glider size 015 file before F6 Sky Taper file. Group 3: Canals prepared using Path Glider size 015 and size 020 files before F6 Sky Taper file. Results: In our study we found that the creation of rotary glide path had no influence on centering ability of F6 Sky Taper rotary file.
Conclusion: It can be concluded that the creation of glide path had no influence on the centering ability and increased the total time involved in preparation of curved canals with F6 Sky Taper rotary single file systems.

Keywords: Centering ability, F6 Sky Taper, Glide path, Path Glider

Introduction
Successful root canal treatment is based on performing the debridement, disinfection, and obturation of the entire root canal system. Initially emphasis was on obturation and sealing the radicular space. However no technique or material provides a seal that is impervious to moisture either from the apical or coronal areas. Early prognosis studies indicated failures were attributed to incomplete obturation [1] This proved fallacious as obturation only reflects the adequacy of the cleaning and shaping. Canals that are poorly obturated are often incompletely cleaned and shaped. Adequate cleaning and shaping and establishing a coronal seal are the essential elements for successful treatment with obturation being less important for short term success [2]. Canal preparation is one of the major steps in root canal treatment and directly related to subsequent disinfection and filling [3]. Sealing the canal space following cleaning and shaping will entomb any remaining organisms and, with the coronal seal, prevent re-contamination of the canal and periradicular tissues [4].
The nickel-titanium single file systems have become a standard tools in endodontics [5]. There was significant improvement of quality of root canal shaping, with predictable results and less iatrogenic damage, even in severely curved canals with nickel-titanium file systems [6].
The F6 Sky Taper (Komet Brasseler, Lemgo, Germany) is new single file instruments used in continuous clockwise rotational motion for quick and safe root canal preparation. The F6 Sky Taper is a new single-use and single-file Ni-Ti system: only one instrument, available in five different sizes (of 20, 25, 30, 35, and 40) with a constant taper of 0.06 is necessary for root canal shaping. Each file is characterized by an S-shaped section.
The glide path is defined as a smooth patent pathway from the canal orifice to its physiologic terminus, which must be discovered when present or prepared when absent [7]. The manual or rotary creation of a glide path is an effective way to preserve root canal anatomy [8]. Of different path-finding rotary systems available for creating of glide path, recently introduced was the Path Glider by Komet Brasseler, Lemgo, Germany. The Path Glider is available in size 015 and 020. Each File is characterized by a kite-shaped cross-section.

Numerous studies have investigated the effect of glidepath on centering ability of different Nickel Titanium single file systems. But there is no research dealing with the effect of glide path on centering ability of F6 Sky Taper single file system. Therefore, the aim of our study was to evaluate the effect of glidepath on the centering ability of F6 Sky Taper single file system in root canals of mandibular first molars.

Materials and Methods

Sixty freshly extracted mandibular molars, extracted for periodontal reasons collected from the Dental section, Community health centre Sankoo kargil ladakh were used for the study. Teeth with completely formed apices and mesio-buccal canal curvature between 20º and 35º assessed according to Schneider's technique [9].

Exclusion criteria for sample selection

- Teeth with canal curvature greater than 35°.
- Teeth with open apices.
- Teeth with calcified canals.
- Teeth with anatomical variations.
- Teeth with caries and restorations invading the pulp.

Equipments and Materials used in the study

1. X-Smart plus Endomotor (Dentsply, Maillefer, Ballaigues, Switzerland).
2. DSLR Camera (Nikon digital, Tokyo, Japan).
3. Diamond discs (0.3mm diameter).
4. Radiographic jig.
5. Modified Bermante muffle system.
6. Digital Vernier calliper.
7. The F6 Sky Taper files (Komet Brasseler, Lemgo, Germany).
8. Path Glider size 015 files (Komet Brasseler, Lemgo, Germany).
9. Path Glider size 015 (Komet Brasseler, Lemgo, Germany).

Selection of root canals

The teeth were disinfected in 5% sodium hypochlorite solution for 30 min. The teeth were then cleaned of calculus, soft tissue tags, debris and attached bone by a periodontal curette and washed with distilled water. The teeth were kept in normal saline until used. Radiographs were taken to evaluate the mesial roots. In each tooth specimen, any one canal of the mesial root was standardized to 9mm length by removing the crown using diamond discs. The canals were controlled for apical patency with ISO no #10 k –files (Dentsply Maillefer, Ballaigues, Switzerland). Working length was established at 9 mm, and was determined by subtracting 0.5 mm from the length at which the tip of a size #10 K-file could be visualized.

A radiographic platform, as described by previous researchers was used to take standardized radiographs prior to instrumentation with the k-file size #10 has been inserted into the buccal or lingual canal in order to determine the degree and radius of the curvature using periapical Kodak Insight films (Eastman Kodak Company, Rochester, NY) [10]. The X-ray tube (Siemens, Heliodent, Germany) was aligned perpendicular to the root canal. The exposure time (0.125; 70Kv, 7mA) was the same for all radiographs. The degree and radius of canal curvature were obtained from these preoperative radiographs with a computer program Corel draw X6 software tools using Schneider technique [10].

Preparation of model

A muffle-block was constructed as given by Aviad *et al*. [11]. After sealing the apices with wax, the canals were mounted in the muffle-block using self-cure acrylic resin (Orthoplast; Vertex, Zeist, the Netherlands). After complete polymerization of the resin, the block was removed from the model, the wax removed and the apical foramen exposed. The blocks were sectioned horizontally at three sites (coronal, middle and apical) by a thin cutting disk (0.3-mm thick) at two levels: one 3 mm from the apex and the other 6 mm from the apex. The disk was mounted on an electric saw (CIR-SAW, Confident Dental Equipments Ltd, India) for cutting the blocks. Photographs were taken of all three cross-sections of each tooth using a DSLR Camera (Nikon Digital, Tokyo, Japan) at a fixed position. The sections were reassembled in the muffle. The specimens were randomly divided into the following three groups:

Group 1: F6 Sky Taper file.

Group 2: Path Glider size 015 file was used before F6 Sky Taper file.

Group 3: Path Glider size 015 and size 020 files were used before F6 Sky Taper file.

All canals were prepared by a single experienced operator. Copious irrigation with 5.0 ml of 5% NaOCl solution using side-vented close ended needles. Finally, the canal were irrigated with 5.0 ml of a 17% EDTA for 3 minutes, followed by 5 ml of 5% NaOCL. All the canals were rinsed with 10 ml of 0.9% sterile saline.

Group 1: root canals were prepared using the F6 Sky Taper system at 300 rpm and 2.2 N/cm torque. The instrument (25/06) was used at WL with gentle in- and out-motion.

Group 2: root canals were prepared using the Path Glider size 015 file at 300 rpm and 0.5 N/cm torque. And then prepared using the F6 Sky Taper system at 300 rpm and 2.2 N/cm torque. The instrument (25/06) was used at WL with gentle in- and out-motion.

Group 3: root canals were prepared using the Path Glider size 015 and size 020 files at 300 rpm and 0.5 N/cm torque. And then prepared using the F6 Sky Taper system at 300 rpm and 2.2 N/cm torque. The instrument (25/06) was used at WL with gentle in- and out-motion.

After instrumentation, all sectioned canals were separated, and then photographed in the same manner as pre-instrumentation photographs. The shaping ability of the rotary instruments was evaluated using the computer program Corel draw X6 software.

Pre-and post-instrumentation measurements were recorded to evaluate the canal centering ability based on the method described by Gambill *et al*. [12]

Assessment of the canal preparation

Centering ability: Centering ability of the instruments towards the original canal was evaluated by the ratio of (*a1-a2*) ÷ (*b1-b2*) or (*b1-b2*) ÷ (*a1-a2*) according to the method developed by Gambil *et al*, in this formula, a1 and b1 represent the thickness of the internal and external sides of the canal wall, respectively, mesiodistally, before instrumentation and a2 and b2 after instrumentation [12]. If these numbers were not equal, the lower number was considered as numerator of

the ratio. A result with ratio 1 indicates that the canal has remained centered and a result less than 1 indicates deviation of the canal outward, and result of more than one show that the canal deviates inward.

Results

No statistically significant differences were found with regards to the centering ability between the groups or amongst the groups at three different locations coronal, middle and apical thirds of the root canals (Table 1). No instrument fracture or signs of deformation was detected.

Groups with glide path had significantly longer total preparation times ($P<0.05$) (Table 2)

Table 1: Mean (SD) of canal centering at different canal sections

Sections	Group 1	Group 2	Group 3	P-value
Coronal	0.77	0.71	0.68	<0.001*
Middle	0.56	0.58	0.57	<0.001*
Apical	0.50	0.49	0.50	<0.001*

Table 2: Mean (SD) of total time (sec) required for canal preparation in study groups

Group 1	Group 2	Group 3
200.37	265.12	270.10

Discussion

The novel single-use single-files launched on the market were made for reciprocating motion. Although single-file reciprocating systems have been shown to offer advantages over multi file rotary systems, greater amounts of debris were packed laterally over dentinal walls and in isthmuses and protrusions of the root canals, and this may be clinically significant finding because this debris may harbor bacteria [13]. The continuous forward motion of the rotary file enables constant exit of debris up the flute of the file; however, each back ward motion of the reciprocating file might pro- vide the opportunity for debris to build up in protrusions and isthmus areas [14]. In addition, the reciprocating motion of the file may not allow the blade to cut into the dentine as cleanly, resulting in a burnishing-type effect and pushing debris into recesses and isthmuses (24). Today the last single-use systems are developed for continuous rotation and not for reciprocating motion. F6 Sky Taper belongs to them. F6 Sky Taper is a single-file system with 6% tapered files. The manufacturer recommended the glide path preparation before the use of continuous single file systems. So in our study we evaluated the effect of glide path on the centering ability of F6 Sky Taper file.

Human teeth were chosen as they simulate clinical conditions better than acrylic blocks. Acrylic resin is not an optimum material to reproduce the micro hardness of testing rotary instruments because it does not emulate dentin or the anatomic variations (enlargements, oval root canals, etc.) [15] It has been mentioned that shape of the flutes of NiTi files was altered when used in plastic blocks, which was not seen with natural teeth; moreover, rotary instrument generated heat when used inside the resin block, which softened the resin material [16, 17] Other studies also have used the extracted teeth [18-21] but different canal anatomies were used; therefore, it was likely to affect their assessment negatively. [22] Natural teeth are the best specimens to evaluate the shaping effects of instrumentation, but they are very difficult to standardize because of different canal curvatures, different canal diameter, and varying dentin hardness.

In our study we evaluated the canal preparation using F6 Sky Taper rotary single file systems with or without glide path on natural human teeth. The parameters assessed were canal centering ability and the time taken for instrumentation. Glide path preparation is well established as an important step before rotary instrumentation, which prevents instrument wear and its separation rate [23-25] However, the role of a glide path for single-file systems has yet to be fully understood. In our study, we found that the creation of rotary glide path had no influence on centering ability of F6 Sky Taper rotary file. However, there is no study published till date which evaluated the effect of glide path preparation on F6 Sky Taper rotary file preparation. The time required by these systems to prepare curved canals decreased, but total preparation time increased; nevertheless, further investigation is warranted to ascertain the full extent of the role played by the preparation of a glide path on the shaping of curved root canals.

Conclusion

Within the limitations of the study, it can be concluded that

1. The creation of glide path increased the total time involved in preparation of curved canals with F6 Sky Taper rotary single file systems.
2. A glide path had no influence on the centering ability of Sky Taper rotary single file systems.

References

1. Ingle JI. editor. Endodontics. 5th Edition ed ed. Hamilton, London: BC Decker, Inc, 2002.
2. Sabeti MA, Nekofar M, Motahhary P, Ghandi M, Simon JH. Healing of apical periodontitis after endodontic treatment with and without obturation in dogs. J Endod 2006; 32(7):628-33.
3. Yang GB, Zhou XD, Zheng YL. Shaping ability of progressive versus constant taper instruments in simulated root canals. Int Endod J. 2006; 39:791-9.
4. Delivanis PD, Mattison GD, Mendel RW. The survivability of F43 strain of Streptococcus sanguis in root canals filled with gutta-percha and Procosol cement. J Endod. 1983; 9(10):407-10,
5. Torabinejad M, Walton RE. Endodontics: principles and practice 4th ed. St. Louis Missouri: Saunders Elsevier, 2009.
6. Peters OA. Current challenges and concepts in the preparation of root canal systems: A review. J Endod. 2004; 30(8):559-67.
7. West JD. The endodontic Glidepath: "Secret to rotary safety". Dent Today. 2010; 29(9):86, 88, 90.
8. D'Amario M, Baldi M, Petricca R, De Angelis F, El Abed R, D'Arcangelo C. Evaluation of a new nickel-titanium system to create the glide path in root canal preparation of curved canals. J Endod. 2013; 39(12):1581-4.
9. Schneider SW. A comparison of canal preparations in straight and curved root canals. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 1971; 2(32):271-5
10. Sydney GB, Batista A, de Melo LL. The radiographic platform: a new method to evaluate root canal preparation *in vitro*. J Endod. 1991; 17:570-2.
11. Tamse A, Raphael Pilo. A new muffle model system to study root canal morphology and instrumentation techniques. JEndod. 1998; 24(8):
12. Gambill JM, Alder M, del Rio CE. Comparison of nickel-titanium and stainless steel hand-file instrumentation using computed tomography. J Endod. 1996; 22(7):369-75.

13. Robinson JP, Lumley PJ, Cooper PR, Grover LM, Walms- ley AD. Reciprocating root canal Technique induces greater debris accumulation than a continuous rotary technique as assessed by 3-dimensional micro-computed tomography. J Endod. 2013; 39(8):1067-70.
14. Poggio C, Dagna A, Chiesa M, Scribante A, Beltrami R, Colombo M. Effects of NiTi rotary and reciprocating instru- ments on debris and smear layer scores: an SEM evalua- tion. J Appl Biomater Funct Mater. 2014; 12(3):256-62.
15. Aydin C, Inan U, Yasar S, Buluci B, Tunca YM. Comparison of shaping ability of RaCe and Hero Shaper instruments in simulated curved canals. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2008; 105(3):92-7.
16. KazeStenman E, Spangberg LS. Machining efficiency and wear resistance of nickel titanium endodontic files. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 1996; 81:596-602
17. Kum KY, Spangberg L, Cha BY, Young J, Seung-Jong L, Chan-Young L. Shaping ability of three ProFile rotary instrumentation techniques in simulated resin root canals. J Endod. 2000; 26:719-23.
18. Alves VDO. Comparison among manual instruments and pathfile and mtwo rotary instruments to create a glide path in the root canal preparation of curved canals. JOE. 2012; 38:117-120.
19. Ajuz NCC. Glide path preparation in s-shaped canals with rotary pathfinding nickel-titanium instruments. J Endod. 2013; 39:534-537.
20. Lopes HP. Torsional properties of pathfinding instruments. Oral Surg Oral Med Oral Patho Oral Radiol Endod. 2011; 112:667-670.
21. Jung-Hong H. Geometric optimization for development of glide path preparation nickel-titanium rotary instrument. J Endod. 2015; 41:916-919.
22. Nazarimoghadam K. An in-vitro comparison of root canal transportation by reciproc file with and without glide path. J Dentistry. 2014; 11:554-559.
23. Berutti E, Negro AR, Lendini M, Pasqualini D. Influence of manual preflaring and torque on the failure rate of Pro Taper rotary instruments. J Endod. 2004; 30(4):228-30.
24. Patino PV, Biedma BM, Liebana CR, Cantatore G, Bahillo JG. The influence of a manual glide path on the separation rate of NiTi rotary instruments. J Endod. 2005; 31(2):114-6.
25. Ehrhardt IC, Zuolo ML, Cunha RS, De Martin AS, Kherlakian D, Carvalho MC. Assessment of the separation incidence of mtwo files used with preflaring: prospective clinical study. J Endod 2012; 38(8):1078-81.