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Effect of Using Rotational and Reciprocating Single File Systems with Different Tapered Coronal Flaring Instruments on Dentinal Crack Formation: An *In Vitro* Study

Farklı Taperli Koronal Genişletme Enstrümanlarının Rotasyonel ve Resiprokal Tek Eğe Sistemlerindeki Dentin Çatlağı Oluşumuna Etkisinin İncelenmesi: *İn Vitro* Çalışma

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ABSTRACT Objective: The purpose of this study was to evaluate the effect of using single-file with different tapered coronal flaring files on dentinal crack. **Material and Methods:** Human extracted mandibular premolars (n=128) were selected and divided into four groups (n=32) based on the coronal flaring instruments; Group 1, One Flare; Group 2, Endoflare; Group 3, Gates Glidden Drills; Group 4, Control Group. Specimens divided into four subgroups based on the single file system (n=8): Subgroup A, HyFlex EDM: Subgroup B, Reciproc Blue: Subgroup C, One Shape: Subgroup D, WaveOne Gold. All roots were then sectioned at 3, 6, and 9 mm from the apex. The sections were inspected under a stereo-microscope at 2.5X and 5X to determine the presence of microcracks. The data were analyzed using the chi-square test (p=0.05). **Results:** There was no statistically significant difference between the distributions of dentinal cracks caused by the use of single-file systems with different coronal flaring files (p>0.05). There was no statistically significant difference between the distributions of dentinal cracks according to single file systems (p>0.05). There was also no statistically significant difference between the distributions of dentinal cracks according to coronal flaring files (p>0.05). **Conclusion:** The use of coronal flaring instruments combinations with single file systems reduced the observation of dentin cracks. One Flare files caused less dentinal cracks than the other instruments test.

Keywords: Coronal flaring; microcracks; single-file systems; One Flare; WaveOne Gold

ÖZET Amaç: Bu çalışmanın amacı, farklı taperli koronal genişletme enstrümanlarının rotasyonel ve resiprokal tek eğe sistemleri ile kullanımının dentin çatlağı üzerine etkisini değerlendirmektir. **Gereç ve Yöntemler:** Çalışmada 128 adet tek köklü mandibular premolar diş koronal genişletme için kullanılacak enstrümanlara göre 4 ana gruba (n=32) ayrılmıştır: Grup 1, One Flare; Grup 2, Endoflare; Grup 3, Gates Glidden drills; Grup 4, Kontrol Grup. Daha sonra örnekler kök kanal şekillendirilmesinde kullanılacak tek eğe sistemlerine göre 4 alt gruba (n=8) ayrılmıştır: Alt Grup A, HyFlex EDM; Alt Grup B, Reciproc Blue; Alt Grup C, One Shape; Alt Grup D, WaveOne Gold. Tüm örneklerden kök ucundan 3, 6 ve 9 mm uzaklıklarda kesitler alınmıştır. Kesitler, mikro çatlakların varlığını belirlemek için bir stereo-mikroskop altında 2,5X ve 5X'de incelenmiştir. Veriler ki-kare testi kullanılarak analiz edilmiştir (p=0,05). **Bulgular:** Tek eğe sistemlerinin farklı koronal flaring eğeler ile kullanmasıyla oluşan dentin çatlaklarının dağılımları arasında istatistiksel olarak anlamlı bir fark yoktur (p>0,05). Tek eğe sistemlerine göre dentin çatlaklarının dağılımları arasında da istatistiksel olarak anlamlı bir fark bulunmamıştır (p>0,05). Bununla birlikte, koronal genişletme eğelerine göre dentin çatlaklarının dağılımları arasında istatistiksel olarak anlamlı bir fark yoktur (p>0,05). **Sonuç:** Tek eğe sistemlerinin koronal flaring estrümanları ile beraber kullanımının dentin çatlaklarının gözlemlenmesini azaltmıştır. One Flare eğeler, diğer koronal genişletme enstrümanlarına göre daha az dentin çatlağına neden olmuştur.

Anahtar Kelimeler: Koronal genişletme; microçatlak; tek eğe sistemleri; One Flare; WaveOne Gold

Coronal flaring during root canal shaping has been thought to be a important step for a successful endodontic treatment in recent years.[1] Coronal flaring offers supplies many advantages: (i) providing straight access of endodontic instruments to the middle and apical part of the canal, (ii) providing straight access to the middle and apical part reduces the risk of instrument fracture, and (iii) allowing irrigants to reach

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the middle and apical region.[2] Moreover, flaring the coronal part of the root may reduce the amount of debris overflowing from the apical region.[2,3]

Endoflare (Micro-Mega, Besançon, France) is a NiTi file with a 12% taper angle that is used for coronal flaring. Endoflare files may be used together with all NiTi systems in the industry. Studies have reported that Endoflare files are less risky and effective than Gates Glidden drills.[4] Another coronal flaring file recently introduced by MicroMega is the One Flare (Micro-Mega, Besançon, France) file system. One Flare files have a 9% taper angle and are manufactured with T-wire heat treatment technology. T-wire technology has enabled the changing of the traditional microstructure of the NiTi alloy to ensure that the tool has higher fatigue resistance and more flexibility. In addition, the instruments produced with T-wire heat treatment offer better flexibility and cyclic fatigue resistance compared to the instruments produced with conventional austenite NiTi alloy according to the manufacturer.[2]

The use of single-file systems has become attractive for clinicians in recent years because they shorten the treatment period and they are easy to use.[5] There are many studies on single-file systems in the literature. These studies include many areas ranging from defects caused by single-file systems in the dentin to debris extrusion.[6-8]

There is no coronal flaring instrument in single-file systems; root canal preparation is performed with a single file. Increased apical extrusion may happen because of insufficient coronal flaring. However, the area of contact of the file with dentinal walls will increase with the use of higher tapered instruments if coronal flaring is performed. Therefore, an increase in momentary stress concentration becomes possible and the risk of dentinal crack also increases.[9] To our knowledge, only 1 study evaluated the effect of the use of single-file systems together with different coronal flaring files on dentinal crack whereas there are several studies in the literature evaluating the effect of coronal flaring files on dentinal crack.[1,2,9]

Therefore, this study aims to evaluate the effect of the use of single-file systems (HyFlex EDM, Reciproc Blue, WaveOne Gold, and One Shape) with different coronal flaring files (Endoflare, One Flare, and Gates Glidden) with different kinematics of motion (rotary or reciprocating) on dentinal crack. The null hypothesis tested is that (1) neither single-file systems nor (2) the use of these systems together with different coronal flaring files has no effect on dentinal crack.

MATERIAL AND METHODS

SAMPLE SELECTION

Ethics committee approval was obtained for this study from Van Yüzüncü Yıl University Non-interventional Clinical Research Ethics Committee (2020/08-04, 23.10.2020). In this study, 128 single rooted mandibular premolar teeth extracted for periodontal or orthodontic reasons were used. Teeth were examined under a stereo-microscope; teeth with cracks or fractures were not included in the study. Soft and hard tissue deposits on the teeth were cleaned using a curette. The crown parts of the teeth were removed with a diamond separating disc under water cooling to standardize their large length to 12 mm.

ROOT CANAL PREPARATION

Access cavities were prepared using diamond drills with a high-speed handpiece under water cooling. A 10 K-type file (Mani Inc, Tochigi, Japan) was placed in the root canal, and the working length of this file was established 1 mm shorter of this length. The specimens were randomly divided into four groups (n=32) based on the coronal flaring instruments;

Group 1, One Flare: The One Flare file was used with a rotary speed of 300 rpm and 3 N/cm torque at a working length of 3 mm.

Group 2, Endoflare: The Endoflare file was used similar to Group 1.

Group 3, Gates Glidden Drills: Each Gates Glidden drill was used with a rotary speed of 800 rpm. The torque suggested by the manufacturer is as follows: size #3 (3 N/cm torque) and size #4 (1 N/cm torque) to a depth of 4 and 3 mm from the coronal, respectively.

Group 4, Control Group: Coronal flaring was not performed in this group.

The files and drills were used with an in-and-out motion. All root canals were irrigated with 2 mL

5.25% NaOCl with a NaviTip irrigation needle placed 1 mm shorter of the working length during coronal flaring. Specimens in both groups were divided into four subgroups based on the single file system used (n=8): Subgroup A, HyFlex EDM (HEDM): Subgroup B, Reciproc Blue: Subgroup C, One Shape, and Subgroup D, WaveOne Gold Primary.

Subgroup A, HyFlex EDM (HEDM): The root canals were prepared with the One File (Size 25) using gentle apical strokes and pecking motions in accordance with the manufacturer's recommendations. The VDW endodontic motor was used to operate the file in continuous rotation at 500 rpm speed and 2.5 N/cm torque.

Subgroup B, Reciproc Blue: The Reciproc Blue file (Size 25) was used in the "Reciproc ALL" program using the VDW in accordance with the manufacturer's recommendations.

Subgroup C, One Shape: The root canals were prepared with a One Shape file (size 25, taper 0.06) using VDW endodontic motor. The file was used in continuous rotation at 400 rpm speed and 4 N/cm torque.

Subgroup D, WaveOne Gold Primary: The root canals were prepared with Primary WaveOne file (size 25) using the VDW endodontic motor in the "WaveOne ALL" program (350 rpm, 170° counterclockwise and 50° clockwise).

Each instrument was used in 5 canals. If there was resistance, it was dediced removal of the instrument and irrigation of root canals. A total volume of 10 mL 5.25% NaOCI was used with a NaviTip irrigation needle. After root canal preparation, all canals were irrigated with 2 mL of distilled water. The roots were kept moist in distilled water to prevent the effect of dehydration on the roots.

Sectioning and Microscopic Examination

All roots were cut 3, 6, and 9 mm horizontally from the apical region with a low-speed diamond saw under water cooling.[10] Afterward, the sections were observed under a stereo-microscope. The specimens were examined and photographed under the stereomicroscope at 2.5x and 5x magnifications (Nikon SMZ25; Nikon Tokyo, Japan) to determine the presence of microcracks (Figure 1). Two independent operators examined a total of 384 digital images. Two different categories regarding crack formation were established as follows; 'no crack' and 'crack'. All lines extending from the root surface or root canal lumen into the dentin were classified as "crack". Notch lines or microcracks from the inner surface of the root canal wall or the outer surface of the root were classified as "no crack".

STATISTICAL ANALYSIS

The data were analyzed by IBM SPSS V23 software. The chi-square test was used to compare dentinal cracks by groups, regions, and subgroups. The results of the analysis were presented as frequency (percentage) for categorical variables. The significance level was considered $p<0.05$.

RESULTS

There was no statistically significant difference between the distributions of dentinal cracks caused by the use of single-file systems with different coronal flaring files (p values were 0.677, 0.908, 0.456, and 0.302, respectively). There was no statistically significant difference between the distributions of dentinal

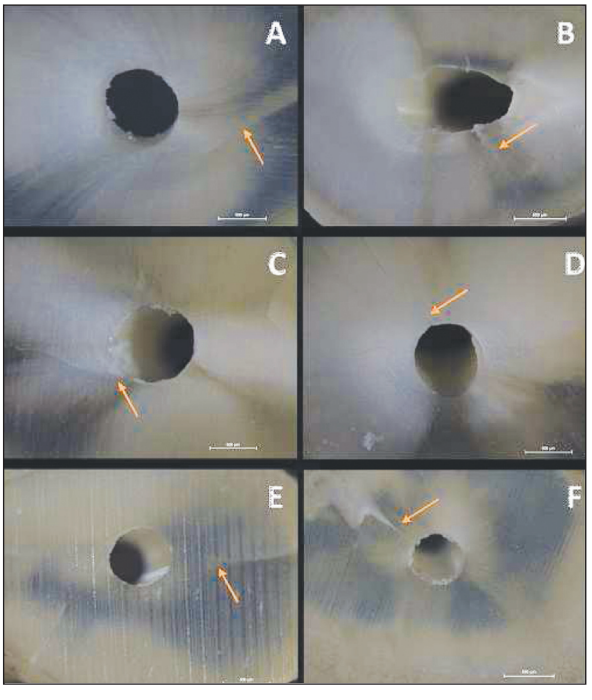

FIGURE 1: Representative microscopic cross sections under 5x magnification from the coronal (**A** and **B**), middle (**C** and **D**) and apical (**E** and **F**) regions of the root with dentin crack.

cracks occurring in different regions of the root (apical, middle, and coronal regions) considering single-file systems (p values were 0.142, 0.931, and 0.751, respectively). There was no statistically significant difference between the distributions of dentinal cracks according to single file systems (p=0.364) (Table 1). There was also no statistically significant difference between the distributions of dentinal cracks according to coronal flaring files (p=0.225) (Table 2). However, a statistically significant difference was found when the crack distributions were evaluated according to the regions (p=0.001) (Table 3).

TABLE 1: Comparison of different single file systems with different tapered coronal flaring files on dentinal crack formation at 3 section of the root canals.

Coronal flaring files	Section level	Crack	HyFlex EDM	Reciproc Blue	One Shape	Waveone Gold	Total	p*
One Flare	Apical	Crack	3 (37.5)	2 (25)	2 (25)	1 (12.5)	8 (25)	0.721
		No crack	5 (62.5)	6 (75)	6 (75)	7 (87.5)	24 (75)	
	Middle	Crack	3 (37.5)	1 (12.5)	1 (12.5)	1 (12.5)	6 (18.8)	0.637
		No crack	5 (62.5)	7 (87.5)	7 (87.5)	7 (87.5)	26 (81.3)	
	Coronal	Crack	1 (12.5)	1 (12.5)	1 (12.5)	0 (0)	3 (9.4)	1.000
		No crack	7 (87.5)	7 (87.5)	7 (87.5)	8 (100)	29 (90.6)	
	Total	Crack	7 (29.2)	4 (16.7)	4 (16.7)	2 (8.3)	17 (17.7)	0.677
		No crack	17 (70.8)	20 (83.3)	20 (83.3)	22 (91.7)	79 (82.3)	
Endoflare	Apical	Crack	2 (25)	3 (37.5)	3 (37.5)	1 (12.5)	9 (28.1)	0.618
		No crack	6 (75)	5 (62.5)	5 (62.5)	7 (87.5)	23 (71.9)	
	Middle	Crack	2 (25)	2 (25)	1 (12.5)	0 (0)	5 (15.6)	0.482
		No crack	6 (75)	6 (75)	7 (87.5)	8 (100)	27 (84.4)	
	Coronal	Crack	1 (12.5)	2 (25)	2 (25)	0 (0)	5 (15.6)	0.456
		No crack	7 (87.5)	6 (75)	6 (75)	8 (100)	27 (84.4)	
	Total	Crack	5 (20.8)	7 (29.2)	6 (25)	1 (4.2)	19 (19.8)	0.908
		No crack	19 (79.2)	17 (70.8)	18 (75)	23 (95.8)	77 (80.2)	
Gates Glidden	Apical	Crack	3 (37.5)	3 (37.5)	3 (37.5)	3 (37.5)	12 (37.5)	0.901
		No Crack	5 (62.5)	5 (62.5)	5 (62.5)	5 (62.5)	20 (62.5)	
	Middle	Crack	1 (12.5)	2 (25)	2 (25)	2 (25)	7 (21.9)	0.947
		No crack	7 (87.5)	6 (75)	6 (75)	6 (75)	25 (78.1)	
	Coronal	Crack	1 (12.5)	1 (12.5)	2 (25)	1 (12.5)	5 (15.6)	0.776
		No crack	7 (87.5)	7 (87.5)	6 (75)	7 (87.5)	27 (84.4)	
	Total	Crack	5 (20.8)	6 (25)	7 (29.2)	6 (25)	24 (25)	0.456
		No crack	19 (79.2)	18 (75)	17 (70.8)	18 (75)	72 (75)	
Control	Apical	Crack	5 (62.5)	3 (37.5)	3 (37.5)	3 (37.5)	14 (43.8)	0.871
		No crack	3 (37.5)	5 (62.5)	5 (62.5)	5 (62.5)	18 (56.3)	
	Middle	Crack	2 (25)	2 (25)	3 (37.5)	3 (37.5)	10 (31.3)	0.515
		No crack	6 (75)	6 (75)	5 (62.5)	5 (62.5)	22 (68.8)	
	Coronal	Crack	2 (25)	1 (12.5)	0 (0)	1 (12.5)	4 (12.5)	0.608
		No crack	6 (75)	7 (87.5)	8 (100)	7 (87.5)	28 (87.5)	
	Total	Crack	9 (37.5)	6 (25)	6 (25)	7 (29.2)	28 (29.2)	0.302
		No crack	15 (62.5)	18 (75)	18 (75)	17 (70.8)	68 (70.8)	
Total	Apical	Crack	13 (40.6)	11 (34.4)	11 (34.4)	8 (25)	43 (33.6)	0.142
		No crack	19 (59.4)	21 (65.6)	21 (65.6)	24 (75)	85 (66.4)	
	Middle	Crack	8 (25)	7 (21.9)	7 (21.9)	6 (18.8)	28 (21.9)	0.931
		No crack	24 (75)	25 (78.1)	25 (78.1)	26 (81.3)	100 (78.1)	
	Coronal	Crack	5 (15.6)	5 (15.6)	5 (15.6)	2 (6.3)	17 (13.3)	0.751
		No crack	27 (84.4)	27 (84.4)	27 (84.4)	30 (93.8)	111 (86.7)	
	Total	Crack	26 (27.1)	23 (24)	23 (24)	16 (16.7)	88 (22.9)	0.364
		No crack	70 (72.9)	73 (76)	73 (76)	80 (83.3)	296 (77.1)	

*Chi-square test.

TABLE 2: The number of specimens with cracks according to coronal flaring files.

		One Flare	Endoflare	Gates Glidden	Control	Total	p*
Crack	Crack	17 (17.7)	19 (19.8)	24 (25)	28 (29.2)	88 (22.9)	0.225
	No crack	79 (82.3)	77 (80.2)	72 (75)	68 (70.8)	296 (77.1)	

*Chi-square test.

TABLE 3: The number of specimens with cracks according to root canal regions.

		Apical	Middle	Coronal	Total	p*
Crack	Crack	43 (33.6)[a]	28 (21.9)[a,b]	17 (13.3)[b]	88 (22.9)	0.001
	No crack	85 (66.4)	100 (78.1)	111 (86.7)	296 (77.1)	

*Chi-square test; [a-b]: There is no difference between groups with the same letter.

DISCUSSION

Coronal flaring files may increase the likelihood of dentinal cracks in the dentin due to their maximum contact with the dentinal walls and having more diameters.[9] This study aims to evaluate the effects of different coronal flaring instruments on dentinal cracks as a result of their use together with HyFlex EDM, Reciproc Blue, WaveOne Gold, and One Shape single-file systems. Both variables (flaring instruments and one file system) did not produce a significant difference in the formation of dentinal cracks and the null hypothesis was accepted in accordance with the results obtained.

The formation of dentinal cracks in the dentin by One Flare, Endoflare, and Gates Glidden was 17%, 19%, and 24%, respectively in this study. There is no study in the literature to which can directly compare our results. Arslan et al. compared Gates Glidden, Protaper Universal, Endoflare, Revo-S, and HyFlex flaring instruments and reported that Gates Glidden drills caused cracks at a higher incidence compared to Endoflare files, similar to our study.[4] Shmesh et al. reported that the use of Gates Glidden drills caused dentinal cracks.[11] Furthermore, Bier et al. reported that coronal flaring files increased the formation of dentinal cracks.[12] However, Liu et al. found that there were no dentinal cracks after coronal flaring with Gates Glidden drills.[13] These contradictory results in the literature are thought to be due to the use of Gates Glidden drills with different sizes (Shemsh et al., Arslan et al. #3 and #4, Liu et al. #1 and #2 Gates Glidden), higher rotation speeds, and different instrument alloys.

Endoflare files caused more dentinal cracks compared to One Flare files in this study. Endoflare files have a 12% taper angle whereas One Flare files have a 9% taper angle. Maximum contact of the Endoflare files with the dentin may have caused more cracks due to higher taper angles.[9] In addition, One Flare files are manufactured with T-wire heat treatment technology. Studies have reported that instruments have higher fatigue resistance and flexibility thanks to this technology.[2]

More dentinal cracks were detected in the control group (without coronal flaring), regardless of the single-file system used, than in the coronal flaring groups (28%) in this study. There are a limited number of studies in the literature evaluating the effect of coronal flaring on dentinal cracks.[9] Borges et al. evaluated the effect of the use of ProTaper Universal, WaveOne, Reciproc, Protaper Next, K File driven by an oscillatory system, and Profile files with and without coronal flaring on dentinal cracks and reported that the use of all files together with coronal flaring caused lower dentinal cracks except ProTaper Universal.[9] This study is in line with our results. Coronal flaring files may reduce the risk of dentinal cracks using single-file systems in root canal treatment.

Reciproc Blue and WaveOne file systems used in this study are file systems with reciprocating movement.[14] Other file systems used in this study are One Shape and HyFlex EDM which operate with continu-

ous rotary motion. The operating system (OS) file is made of conventional NiTi alloy and has a 6% constant taper value along the shaft. In addition, OS has three cutting edges and a triangular section at the end whereas it has two cutting edges of the three cutting edges towards the stem at the middle, and two edges with a modified "S" section at the shaft.[15] HyFlex EDM is manufactured with CM-Wire technology and has varying diameters along the shaft. It is 'quadratic' in the apical region, 'trapezoidal' in the middle region, and 'triangular' in the coronal region.[16,7] In this study, the most dentinal crack formation was observed in HyFlex EDM, followed by Reciproc Blue, One Shape, and WaveOne Gold file systems respectively when the effect of HyFlex EDM, Reciproc Blue, One Shape, and WaveOne Gold single-file systems (without coronal flaring) on dentinal crack was evaluated. There are many studies in the literature evaluating the effect of single-file systems on dentinal cracks. Studies have reported that all file systems create microcracks in the dentin and the degree of dentin damage may vary depending on the tip design of the tool, cross-sectional geometry, NiTi alloy where the file is produced at a fixed or progressive taper angle, and kinematic motion properties.[10,13,17]

These studies have reported contradictory results even though there are a limited number of studies in the literature evaluating the effect of kinematic motions on dentinal cracks. Bürklein et al. reported that the reciprocating files caused more dentinal cracks whereas Lui et al. reported that the reciprocating motion caused fewer dentinal cracks than the continuous rotation motion.[10,18] The highest dentinal crack was observed in HyFlex EDM, which performs continuous rotational motion whereas the lowest dentinal crack was detected in Wave One Gold, one of the reciprocating systems when the results of this study were evaluated. However, it would be contradictory to say that kinematic movement has an effect on dentinal crack according to the results obtained in this study.

Studies have reported that increased taper angle causes more stress on the root canal walls and therefore, more dentinal cracks occur.[12,19] Bier et al. reported that nontapered files did not damage the root canal walls.[12] One Shape files have 6% fixed taper angle and WaveOne Gold files have a 7% fixed taper angle in the apical region and they gradually decrease towards the coronal region whereas the HyFlex EDM and Reciproc Blue files used in this study have variable conicity increasing from 0.04 to 0.08 from apical to coronal.[16,18,20] HyFlex EDM files caused the most dentinal cracks and are the file system with the most taper angle according to the results obtained in this study. However, Dane et al. reported that rotary file systems used at higher speed and torque cause more stress on the root canal walls and thus increase the risk of dentinal cracks, which supports our study.[21]

The distribution of dentinal crack according to root canal regions (apical, middle, coronal) was found to be 33.6%, 28%, and 17%, respectively after evaluation in this study. More dentinal cracks were observed in the apical region than in the middle and coronal region and it makes a statistically significant difference according to the results obtained.[22,23] Karataş et al. reported that 25%, 35.7%, and 39.3% of dentinal cracks are in apical, middle, and coronal regions, respectively.[22] However, Shantiaee et al. found more dentinal cracks in the apical region compared to the middle and coronal region.[23] These contradictory results may be attributed to the use of different file systems.

There are many studies in the literature evaluating dentinal cracks, and the stereo-microscopy method was most commonly used in these studies.[4,6,9,11-13,17,18] However, De-Deus et al. have recommended the use of the micro-computed tomography (micro-CT) method in the evaluation of dentinal cracks in recent years.[24] The sectioning method is used for stereo-microscope examination. Thus, the defects present in the root during cross-sectional sampling spread to different regions of the root and are considered as dentinal cracks.[25] However, it is a more non-destructive method since the cross-sectioning method is not used in micro-CT imaging. It also allows for the evaluation of pre-instrumentation samples.[24] There are contradictory results in the literature despite the advantages of the micro-CT method in the evaluation of dentinal cracks.[26-28] It has been reported that these contradictory results may be due to different micro-CT resolutions, differences in the number of cross-sectional images, and misinterpretation of ring artifacts.[28] Çapar et al. compared the different methods [micro-CT, cone beam computed tomogra-

phy (CBCT), stereo-microscope, and scanning electron microscope (SEM)] used in the evaluation of dentinal crack in recent years.[29] They reported that CBCT and SEM imaging methods were not suitable for microcrack evaluation, and micro-CT (43.9%) and stereo-microscope (45.8%) gave similar results and did not produce a statistically significant difference. A stereo-microscope was used to evaluate dentinal crack in the present study. However, the most important limitation of this study is that the use of the cross-sectioning method and obtaining images before instrumentation may lead to false-positive results. Further studies are needed in the same samples where both methods are evaluated since there is still no clear idea about the interpretation of the results obtained after stereo microscopy and micro-CT evaluations.

CONCLUSION

One Flare files tend to cause fewer dentinal cracks compared to Endoflare files and Gates Glidden drills. The use of single-file systems together with coronal flaring instruments reduces trauma to the dentinal walls and is clinically more reliable.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Esin Özlek;* ***Design:*** *Esin Özlek;* ***Control/Supervision:*** *Esin Özlek;* ***Data Collection and/or Processing:*** *Gizem Kadı, Furkan Evrendilek;* ***Analysis and/or Interpretation:*** *Esin Özlek, Gizem Kadı;* ***Literature Review:*** *Esin Özlek, Gizem Kadı;* ***Writing the Article:*** *Esin Özlek;* ***Critical Review:*** *Esin Özlek.*

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