DOI: 10.7860/JCDR/2024/68578.19335

Original Article

Dentistry Section

CBCT Comparison of the Remaining Dentin Thickness Following Biomechanical Teeth Preparation using Edge Endo X7, Hero Gold, and Neo Endo Flex Rotary File Systems: An In-vitro Study

BANAVATHU PRIYANKA[1], PARVATHANENI KRISHNA PRASAD[2], TBVG RAJU[3], SESHADRI ABITHA[4], NADIMPALLI MAHENDRA VARMA[5], DONDAPATI GOWTAM DEV[6]

ABSTRACT

Introduction: Success in endodontics depends on canal preparation, disinfection, and obturation. Cleaning and shaping play a pivotal role in successful endodontic therapy. An important factor in preventing procedural mishaps and further complications is the quantity of dentine removed during instrumentation because the fracture resistance of the root is directly influenced by the amount of dentine that remains after instrumentation.

Aim: To evaluate and compare the remaining dentine thickness of the root canal after instrumentation with three different rotary file systems using Cone Beam Computed Tomography (CBCT) imaging.

Materials and Methods: Thirty permanent extracted, single-rooted teeth were collected. The samples were decoronated at the level of the Cementoenamel Junction (CEJ). A pre-instrumentation CBCT scan was taken. Access opening and working length were determined. The samples were randomly assigned to three groups: Group I - Edge Endo X7, Group II- Hero Gold, Group III - Neo-endo flex files. Biomechanical preparation was carried out using the respective files. To evaluate the remaining dentine thickness, a comparison was made with the pre-instrumentation CBCT scan. Statistical analysis was performed using One-way ANOVA.

Results: Upon inter-group comparison of the pre-instrumentation group, no significant difference ($p \geq 0.05$) was observed. Post-instrumentation, it was noted that the remaining dentine thickness in Group I ($p \leq 0.05$) at the apical third was significantly less than in Group II ($p=0.007$) and Group III ($p=0.042$). Maximum preservation of dentine was seen with Hero gold files, whereas the minimum preservation of dentine was seen with Edge Endo X7.

Conclusion: Hero gold files exhibited less removal of dentine apically, whereas Edge Endo X7 showed more removal of dentine apically.

Keywords: Heat-treated files, Nickel-titanium files, Residual dentine thickness

INTRODUCTION

Endodontic success mainly relies on adequately cleaning and shaping the root canal, ensuring mechanical instrumentation balances the removal of infected dentine, disrupts bacterial biofilms, and maintains sufficient dentine thickness [1]. Residual dentine thickness is critical as it limits instrumentation and directly impacts root strength and dentinal wall thickness [2]. A decrease in dentine thickness increases the likelihood of tooth fracture, with flaring reducing root fracture resistance and potentially causing stripping and vertical fractures [3].

Among various methods for evaluating remaining dentine thickness, CBCT imaging offers comprehensive three-dimensional measurements with minimal radiation exposure [4]. Traditional endodontic treatment involved hand instrumentation, with stainless steel files replacing carbon steel. Nickel-titanium (NiTi) rotary instruments reduce biomechanical preparation time, enhance root canal shaping, and decrease clinical errors [5].

Obtaining an appropriate canal taper without excessive dentine removal is crucial, highlighting the significance of selecting the correct file system. Edge Endo X7 files (Edge Endo; United States) utilise FireWire technology, a proprietary process combining heat treatment and cryogenic applications to improve flexibility and resistance, and reduce the shape memory effect in NiTi instruments [6].

Hero gold files (Micro Mega, Becacon, France) are designed with a variable helical angle and an adapted pitch that increases with the taper of the instrument, preventing the screwing effect of the instrument. Neoendo Flex Files (Orikam Healthcare India Private Limited) are third Generation Rotary Files with a triangular cross-section. These files have undergone a specialised heat treatment process that enhances their flexibility. They feature a non-cutting safety tip to prevent accidental apical transportation [7].

While various Ni-Ti endodontic files have been recently developed, no study has yet examined the remaining dentine thickness of Edge Endo X7. A previous study by Majumdar TK et al., using a similar concept and methodology, assessed the canal transportation and canal centering ability of this file [8]. The manufacturer claims that Edge Endo X7 has increased flexibility due to annealed heat treatment. Thus far, no studies have compared the remaining dentine thickness of Edge Endo X7, Hero Gold, and Neo Endo Flex rotary files. Therefore, the objective of this study was to evaluate the remaining dentine thickness using three different rotary file instruments through CBCT imaging.

MATERIALS AND METHODS

The in-vitro study was conducted in the Department of Conservative Dentistry and Endodontics at Sree Sai Dental College and Research Institute, Srikakulam, Andhra Pradesh, India, from September 2022 to November 2022. Institutional ethical committee approval (SSDCRI/

IEC/2022/5/S4) was obtained to utilise extracted human teeth for research purposes.

Inclusion criteria: The study included fully matured, intact, single-rooted maxillary anterior teeth with less than a 10-degree angulation, extracted due to poor periodontal conditions.

Exclusion criteria: The study excluded teeth with carious lesions, internal resorption, immature apices, fractures, or any other developmental abnormalities.

Procedure

A total of thirty maxillary anterior teeth were included in the study (10 teeth for each group). The teeth crowns were decoronated at the CEJ level using a diamond disc and slow-speed straight handpiece, and all roots were standardised to have a uniform 16 mm length from the apex. After the endodontic access cavity preparation, a K-file size #15 was passively introduced into the root canal. The working length was determined to be 1 mm short of the apex. Modeling wax was used to prepare the occlusion rims with dimensions identical to the CBCT bite plane. Based on the CBCT's field of view, five teeth were inserted in each occlusal rim, so each group consists of two occlusal rims. Pre-instrumentation cone-beam computed tomography CBCT (VATECH A9 MODEL PHT 30 CSS Version 1.03) scans with an exposure period of 90kVp and 7.0 mA were obtained for each sample, serving as baselines. Root canal samples were randomly divided into three groups i.e ten teeth in each group (n=10). Biomechanical preparation was performed with various file systems according to the groups.

- In Group-I, root canals were prepared using a set of EdgeEndo X7, utilising a torque-controlled endodontic motor with an in-and-out motion at 300 rpm and 2 Ncm torque. The entire specimens were prepared according to the manufacturer's recommendation. Root canals were prepared upto 30/0.06 until they reached the full working length.
- In Group-II, root canals were prepared using a set of Hero Gold, utilising a torque-controlled endodontic motor with an in-and-out motion at 300 rpm and 2 Ncm torque. The entire specimens were prepared according to the manufacturer's recommendation. Root canals were prepared upto 30/0.06 until they reached the full working length.
- In Group-III, root canals were prepared using a set of NeoEndo Flex rotary files, utilising a torque-controlled endodontic motor with an in-and-out motion at 300 rpm and 2 Ncm torque. The entire specimens were prepared according to the manufacturer's recommendation. Root canals were prepared upto 30/0.06 until they reached the full working length.

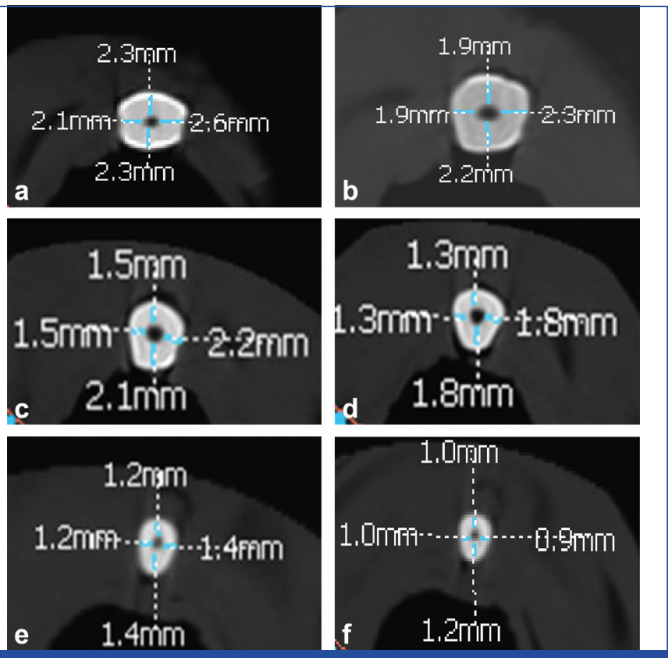
Canals were irrigated with 3% Sodium Hypochlorite (NaOCl) after each instrument, delivered through a 27-gauge needle, allowing for adequate backflow. Lubricant was used throughout the procedure. After biomechanical preparation, at three distinct levels - 3 mm, 5 mm, and 7 mm from the apex - post-instrumentation CBCT scans were obtained and compared to the pre-instrumentation CBCT image, and the amount of dentine thickness that remained was assessed [Table/Fig-1].

STATISTICAL ANALYSIS

Descriptive statistics, paired t-tests, and one-way ANOVA were performed. Post-hoc Tukey analysis was used to analyse the differences among the groups. A p-value ≤0.05 was considered statistically significant for all tests. The mean±standard deviation was used to express the variables.

RESULTS

Each of the three study groups showed a significant difference between pre-instrumentation and post-instrumentation remaining dentine thickness at the coronal, middle, and apical thirds (p≤0.05). [Table/Fig-2-4] represent the comparison of pre-instrumentation and post-instrumentation remaining dentine thickness in groups 1, 2, 3, respectively. Inter-group comparison of remaining dentine thickness (pre-instrumentation) showed no significant difference



[Table/Fig-1]: a,b) Pre-instrumentation and post-instrumentation Cone Beam Computed Tomography (CBCT) images (coronal third); c,d) Pre-instrumentation and post-instrumentation CBCT images (middle third); e,f) Pre-instrumentation and post-instrumentation CBCT images (apical third).

Location	Time	N	Mean	Std. Deviation	Std. Error	t value	p-value
Coronal	Pre	10	1.95	0.302	0.095	4.42	**0.0021***
	Post	10	1.51	0.15	0.047		
Middle	Pre	10	1.59	0.25	0.8	4.48	**0.002***
	Post	10	1.22	0.119	0.037		
Apical	Pre	10	0.912	0.256	0.8	4.32	**0.0026***
	Post	10	0.58	0.092	0.029		

[Table/Fig-2]: Comparison of pre-instrumentation and post-instrumentation remaining dentine thickness in Group-I (Edge Endo X7).
Paired samples t-test; p≤0.05 considered statistically significant; * denotes statistical significance

Location	Time	N	Mean	Std. Deviation	Std. Error	t value	p-value
Coronal	Pre	10	1.745	0.155	0.049	8.74	**<0.001***
	Post	10	1.465	0.144	0.045		
Middle	Pre	10	1.47	0.14	0.047	9.89	**<0.001***
	Post	10	1.21	0.13	0.042		
Apical	Pre	10	1.02	0.12	0.038	4.6	**0.001***
	Post	10	0.795	0.133	0.042		

[Table/Fig-3]: Comparison of pre-instrumentation and post-instrumentation remaining dentine thickness in Group-II (Hero Gold).
Paired samples t-test; p≤0.05 considered statistically significant; * denotes statistical significance

Location	Time	N	Mean	Std. Deviation	Std. Error	t value	p-value
Coronal	Pre	10	1.78	0.144	0.045	10.71	**<0.001***
	Post	10	1.51	0.1	0.031		
Middle	Pre	10	1.405	0.179	0.056	7.37	**<0.001***
	Post	10	1.19	0.143	0.045		
Apical	Pre	10	0.87	0.179	0.056	6.091	**<0.001***
	Post	10	0.707	0.159	0.05		

[Table/Fig-4]: Comparison of pre-instrumentation and post-instrumentation remaining dentine thickness in Group-III (Neo Endo Flex).
Paired samples t-test; p≤0.05 considered statistically significant; * denotes statistical significance

(p≥0.05) between the groups at all three levels of assessment [Table/Fig-5]. In the post-instrumentation group, a significant difference was observed at the apical third (p=0.004) between the three groups [Table/Fig-6].

Location	Group	N	Mean	Std. Deviation	Std. Error	F value	p-value
Coronal	I	10	1.95	0.302	0.095	2.78	0.08
	II	10	1.74	0.156	0.049		
	III	10	1.78	0.144	0.045		
Middle	I	10	1.59	0.25	0.08	2.406	0.109
	II	10	1.47	0.149	0.047		
	III	10	1.4	0.179	0.056		
Apical	I	10	0.912	0.256	0.08	1.77	0.189
	II	10	1.02	0.12	0.038		
	III	10	0.87	0.179	0.056		

[Table/Fig-5]: Comparison of pre-instrumentation remaining dentine thickness between the study groups.
One-way analysis of variance; p ≤0.05 considered statistically significant

Location	Group	N	Mean	Std. Deviation	Std. Error	F value	p-value
Coronal	I	10	1.51	0.15	0.047	0.453	0.64
	II	10	1.46	0.144	0.045		
	III	10	1.51	0.10	0.031		
Middle	I	10	1.22	0.119	0.037	0.146	0.865
	II	10	1.21	0.135	0.042		
	III	10	1.19	0.143	0.045		
Apical	I	10	0.58 a,b	0.092	0.029	6.77	**0.004***
	II	10	0.79a	0.133	0.042		
	III	10	0.707b	0.159	0.05		

[Table/Fig-6]: Comparison of post-instrumentation remaining dentine thickness between the study groups.

One analysis of variance; p≤0.05, was considered statistically significant; Groups with similar alphabets as superscript demonstrated significant differences in post hoc analysis; Group-I vs II (p=0.007); Group-I vs III (p=0.042), Group-II vs III (p=0.22).

DISCUSSION

The present study showed that canals prepared with Hero Gold files preserved more dentine apically when compared to other file systems. Endodontic therapy treats the tooth from within, and its success is based on a combination of thorough canal debridement, effective disinfection, and complete three-dimensional obturation of the canal space [9]. Thus, for the success of endodontic therapy, the most important step is biomechanical preparation [10].

According to the European Society of Endodontics' quality recommendations, the main objectives of root canal instrumentation are to remove any pulpal remnants, eliminate debris, and maintain canal centricity during biomechanical preparation [11]. In the past few decades, several techniques have been reported for assessing endodontic instrumentation including plastic models [12], histologic sections [13], scanning electron microscopic studies, serial sectioning [14], radiographic comparisons, and silicone impressions of instrumented canals [15]. In this study, the remaining root dentine thickness was assessed using CBCT, a non-destructive technique for evaluating endodontic instrumentation. CBCT provides high-quality, quantifiable, and accurate images, enabling a practical and non-destructive assessment before and after shaping [16].

After biomechanical preparation, the root canal should have a conical shape that is progressively tapering. Preserving the apical foramen without transportation is important [17]. The fracture resistance of the root depends on the thickness of the remaining dentine following biomechanical preparation [18]. Aggressive preparation of the apical third reduces the remaining dentine, weakening the apical root structure [19].

In the present research, results were analysed at the coronal third, middle third, and apical third of the tooth to understand the impact of the instrument's shape and the percentage of increase in its taper during the biomechanical preparation of the root canal in all the groups. In the present study, Group-II showed less removal of root dentine compared to Group-III and Group-I. This may be due to its flexibility and its adapted helical pitch design.

This helical pitch design avoids the screwing effect as the cutting edges' helical angle changes from the tip to the shank. Accordingly, pitch changes with taper; the more tapered an instrument is, the longer its pitch, which increases instrument performance. The results are in accordance with the study done by Suneetha MG et al., who observed that Hero Shaper files resulted in significantly greater preservation of dentine when compared to Mtwo files, ProTaper Next files, and Manual K files [20]. Another study was done by Reddy KS et al., who compared RDT with ProTaper, iRace, and Hero Shaper files. They concluded that ProTaper causes higher thinning of root dentine when compared with iRace and Hero Shaper files [21].

Group-I showed more removal of root dentine compared to other groups. This may be attributed to the file system configuration and design. The Edge Endo X7 file system shows a constant taper, variable pitch, and the presence of radial lands. The larger surface areas of the root canal walls come in contact with files that have a larger radial land and a wider cutting surface. This further increases the lateral resistance of the file encounters, and consequently, the torque generated during preparations. Dane A et al., in his study, explained that not only the energy endured by the NiTi instrument but also the stresses applied to the root dentine are reflected in the torque generated during canal shaping [22]. Gambarini G et al., in their study, explained that the initial progression of the Edge Endo X7 instrument into the canal resulted in lower torque, but sudden increases in torque value resulted in taper lock. Peak torque was observed in the last 4 to 5 seconds, which corresponds to the apical third, generating more stress at the apical region [23]. The cross-sectional design of this file system and the K3XF file system are similar, including the presence of radial lands, variable pitch, and increasing helical angle. To compare the findings of this study, to date, not enough published data on this rotary file related to its cutting efficiency, which could affect the dentine thickness, and further research is required in this regard.

Group-III showed more removal of dentine compared to Group-II and less removal of dentine compared to Group-I, which may be due to its triangular cross-section, with sharp cutting edge and safety non-cutting tip. NeoEndo Flex files undergo a specialised heat treatment process, which gives them unique flexibility characteristics, and flutes do not open up when stress levels are reached, yet the file does not present shape memory [17]. Similar studies from the literature have been compared in [Table/Fig-7] [20,21,24-27].

Author's name and year	Place of study	Samples size	Files compared	Parameters assessed	Conclusion
Banavathu P et al., (Present study)	India	30 (n=10)	Edge endo X7 Hero Gold Neo endo flex	Remaining Dentine thickness	Hero gold files showed lesser removal of dentine apically, whereas Edge endo showed more removal of dentine apically.

Mangat P et al., 2018 [24]	India	30 (n=15)	Revo -s Neo endo flex	Remaining Dentine thickness (RDT)	Revo-s shaped more amount of RDT than Neo endo flex
Sigadam DA et al., 2020 [25]	India	24 (n=12)	Neo endo flex XP endo shaper	Remaining dentine thickness (RDT)	In comparison to Neo endo flex files, XP endo shaper showed better results
Makati D et al., 2018 [26]	India	60 (n=30)	K3xf Self-adjusting file	Remaining dentine thickness and Fracture resistance of conventional and access and biomechanical preparation	Coronal dentine was conserved in molars when accessed through conservative than through conventional. The dentine conservation afforded an increased resistance to fracture in the conservative group which doubled the fracture resistance in the conventional group
Kishan KV et al., 2023 [27]	India	30 (n=15)	Edge endo X7	Effect of Conventional and truss Access cavities on Remaining dentine thickness, Centering ability, Canal transportation	At all levels, there is no statistically significant difference between RDT and canal-centering ability. When comparing canal transportation, both groups show a statistically significant difference at 3 mm from the apex. This suggests that conventional access cavity preparation is better than truss access preparation.
Suneetha MG 2019 [20]	India	100 (n=20)	Hand ss – k files Mtwo file Protaper Next Hero Shaper	Remaining dentine thickness	In comparison to manual Kfiles, rotary, Mtwo, and ProTaper Next, Hero shaper files preserved a greater amount of dentine.
Reddy KS et al., 2014 [21]	India	30 (n=10)	Protaper rotary iRace Hero Shaper	Remaining Dentine thickness	When compared to iRace and Hero shaper rotary files, Protaper results in a greater thinning of the dentine at the middle third of the root.

[Table/Fig-7]: Similar studies from the literature [20,21,24-27].

Limitation(s)

The limitation of the present study is that the samples are single-rooted maxillary anterior teeth, which are usually straight. Curvatures of the root canals also influence the remaining dentine thickness after biomechanical preparation, which is not analysed in the present study. A further drawback of the current study is that it was conducted in vitro, which limits its ability to accurately replicate in vivo or clinical conditions.

CONCLUSION(S)

In this study, it was observed that all three file systems resulted in a decrease in dentine thickness after biomechanical preparation. However, Hero Gold files showed the maximum amount of remaining dentine thickness apically. When comparing the three file systems, Hero Gold files demonstrated greater preservation of dentine followed by Neo Endo Flex files, with lesser preservation seen in Edge Endo X7. Therefore, within the limitations of this study, it can be concluded that Edge Endo X7 rotary files remove dentine more aggressively, mainly at the apical third, when compared to other files. Further studies should investigate these outcomes in multi-rooted teeth and different root portions. To observe the impact of remaining dentine thickness, subsequent studies should explore the use of various file motions, metallurgies, and tapers. More investigations are required to achieve a robust conclusion about the impact of these heat-treated files on remaining dentine thickness.

REFERENCES

[1] Rao MS, Shameem A, Nair R, Ghanta S, Thankachan RP, Issac JK. Comparison of the remaining dentin thickness in the root after hand and four rotary instrumentation techniques: An in vitro study. J Contemp Dent Pract. 2013;14(4):712-17.

[2] Zuckerman O, Katz A, Pilo R, Tamse A, Fuss Z. Residual dentin thickness in mesial roots of mandibular molars prepared with lightspeed rotary instruments and Gates-Glidden reamers. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2003;96(3):351-55.

[3] Sathorn C, Palamara JE, Palamara D, Messer HH. Effect of root canal size and external root surface morphology on fracture susceptibility and pattern: A finite element analysis. J Endod. 2005;31(4):288-92.

[4] Aguiar CM, de Andrade Mendes D, Câmara AC, de Figueiredo JA. Evaluation of the centering ability of the ProTaper Universal rotary system in curved roots in comparison to Nitiflex files. Aust Endod J. 2009;35(3):174-79.

[5] Aguiar CM, Mendes DDA, Camara AC, Figueiredo JAD. Assessment of canal walls after biomechanical preparation of root canals instrumented with protaper universal rotary system. J Appl Oral Sci. 2009;17(6):590-95.

[6] Platinum E, Edge GlidePath EF, GlidePath EF. Extremely flexible files. Br Dent J. 2021;231(5):311.

[7] Chhabra A, Ramya KP, Prathap BS, Yadav P. Life span of Neoendo Flex and ProTaper Next rotary files with reciprocating motion in single-rooted teeth. J Conserv Dent Endod. 2023;26(4):420-23.

[8] Majumdar TK, Chowdhury M, Mukherjee S, Mazumdar P. Cone-beam computed tomography assessment of root canal transportation and evaluation of canal centering using Protaper Gold, XP Endoshaper, and Edgefile X7. Endodontology. 2022;34(2):121-26.

[9] Pathak S. In vitro comparison of Kfile, mtwo, and wave one in cleaning efficacy and instrumentation time in primary molars. CHRISMED Journal of Health and Research. 2016;3(1):60-64.

[10] Tambe VH, Nagmode PS, Abraham S, Patait M, Lahoti PV, Jaju N. Comparison of canal transportation and centering ability of rotary protaper, one shape system and wave one system using cone beam computed tomography: An in vitro study. J Conserv Dent. 2014;17(6):561-65.

[11] Shahriari S, Abedi H, Hashemi M, Jalalzadeh SM. Comparison of removed dentin thickness with hand and rotary instruments. Iran Endod J. 2009;4(2):69-73.

[12] Weine FS, Kelly RF, Bray KE. Effect of preparation with endodontic handpieces on original canal shape. J Endod. 1976;2(10):298-303.

[13] Walton RE. Histologic evaluation of different methods of enlarging the pulp canal space. J Endod. 1976;2(10):304-11.

[14] Seidler B. Root canal filling: An evaluation and method. J Am Dent Assoc. 1956;53(5):567-76.

[15] Bramante CM, Berbert A, Borges RP. A methodology for evaluation of root canal instrumentation. J Endod. 1987;13(5):243-45.

[16] Ramanathan S, Solete P. Cone-beam computed tomography evaluation of root canal preparation using various rotary instruments: An in vitro study. J Contemp Dent Pract. 2015;16(11):869-72.

[17] Tomer AK, Miglani A, Chauhan P, Nagarjuna P, Rana S, Kumari A. An in-vitro evaluation of remaining dentine thickness through CBCT using different files. International Journal of Applied Dental Sciences. 2018;4(3):09-13.

[18] Yang Q, Cheung GS, Shen Y, Huang D, Zhou X, Gao Y. The remaining dentin thickness investigation of the attempt to remove broken instrument from mesiobuccal canals of maxillary first molars with virtual simulation technique. BMC Oral Health. 2015;15(1):01-08.

[19] Dhingra A, Ruhal N, Miglani A. Evaluation of single file systems reciproc, oneshape, and waveone using cone beam computed tomography- An in vitro study. J Clin Diagn Res. 2015;9(4):ZC30-34.

[20] Suneetha MG, Moiz AA, Sharief H, Yedla K, Baig MM, Abu Al Qomsan MAS. Residual root dentin thickness for three different rotary systems: A comparative cone beam computed tomography in vitro study. J Indian Soc Pedod Prev Dent. 2020;38(1):48-55.

[21] Reddy KS, Prasad SD, Kumar CS, Reddy VR, Basa MH, Karteek S. Comparison of remaining root dentine thickness after three rotary instrumentation techniques by cone beam computerized tomography: An in vitro study. Journal of Research and Advancement in Dentistry. 2014;3(3S):32-39.

[22] Dane A, Capar ID, Arslan H, Akçay M, Uysal B. Effect of different torque settings on crack formation in root dentin. J Endod. 2016;42(02):304-06.

[23] Gambarini G, Galli M, Seracchiani M, Di Nardo D, Versiani MA, Piasecki L, et al. In Vivo evaluation of operative torque generated by two nickel-titanium rotary instruments during root canal preparation. Eur J Dent. 2019;13(4):556-62.

[24] Mangat P, Tomer AK, Behera A, Mittal N, Bhagat V. Evaluation of remaining dentine thickness using Revo system through CBCT-an in vitro study. Int J Curr Res. 2018;10(10):74243-46.

[25] Sigadam DA, Satish DK, Girija D, Sajjan S, Varma DM, Babu DK, et al. Comparative evaluation of radicular dentine thickness in danger zone of mandibular first molar after instrumentation with two different rotary systems using CBCT- An in vitro study. IJMSDR. 2020;4(8):39-43.

[26] Makati D, Shah NC, Brave D, Singh Rathore VP, Bhadra D, Dedania MS. Evaluation of remaining dentin thickness and fracture resistance of conventional and conservative access and biomechanical preparation in molars using cone-beam computed tomography: An in vitro study. J Conserv Dent. 2018;21(3):324-27.

[27] Kishan KV, Krushn S, Shroff M, Saklecha P. Comparative evaluation of the effect of conventional and truss access cavities on remaining dentin thickness, canal transportation, and canal centering ability in mandibular molars using cone-beam computed tomography. Endodontology. 2023;35(2):137-41.

PARTICULARS OF CONTRIBUTORS:
1. Postgraduate Student, Department of Conservative Dentistry and Endodontics, Sree Sai Dental College and Research Institute, Srikakulam, Andhra Pradesh, India.
2. Professor and Head, Department of Conservative Dentistry and Endodontics, Sree Sai Dental College and Research Institute, Srikakulam, Andhra Pradesh, India.
3. Professor, Department of Conservative Dentistry and Endodontics, Sree Sai Dental College and Research Institute, Srikakulam, Andhra Pradesh, India.
4. Professor, Department of Conservative Dentistry and Endodontics, Sree Sai Dental College and Research Institute, Srikakulam, Andhra Pradesh, India.
5. Professor, Department of Conservative Dentistry and Endodontics, Sree Sai Dental College and Research Institute, Srikakulam, Andhra Pradesh, India.
6. Reader, Department of Conservative Dentistry and Endodontics, Sree Sai Dental College and Research Institute, Srikakulam, Andhra Pradesh, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Banavathu Priyanka,
Postgraduate Student, Department of Conservative Dentistry and Endodontics,
Sree Sai Dental College and Research Institute, Srikakulam-532001,
Andhra Pradesh, India.
E-mail: priyanayak993@gmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Nov 20, 2023
- Manual Googling: Jan 17, 2024
- iThenticate Software: Feb 22, 2024 (20%)

ETYMOLOGY: Author Origin

EMENDATIONS: 7

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **Nov 19, 2023**
Date of Peer Review: **Jan 19, 2024**
Date of Acceptance: **Feb 27, 2024**
Date of Publishing: **Apr 01, 2024**