ISSN: 2581-5989
PubMed - National Library of Medicine - ID: 101738774

International Journal of Dental Science and Innovative Research (IJDSIR)

IJDSIR : Dental Publication Service

Available Online at: www.ijdsir.com

Volume – 5, Issue – 1, February - 2022, Page No. : 173 - 179

Comparative evaluation of effect of rotary file and lentulo spiral usage at different speeds on apical extrusion of calcium hydroxide: An Invitro study

[1]Dr. Pooja Vinayak Gaikwad, Post graduate student, Dept of Conservative Dentistry & Endodontics, YCMM and RDF'S Dental College, Ahmednagar, Maharashtra, India.

[2]Dr. Sarvesha Bhondwe, Professor and HOD, Conservative Dentistry and Endodontics, YCMM and RDF'S Dental College, Ahmednagar, Maharashtra, India.

[3]Dr. Vishal Mahajan, Professor, Dept of Conservative Dentistry and Endodontics, YCMM and RDF'S Dental College, Ahmednagar, Maharashtra, India.

[4]Dr. Sonam Muthiyan, Associate Professor, Dept of Conservative Dentistry and Endodontics, YCMM and RDF'S Dental College, Ahmednagar, Maharashtra, India.

[5]Dr. Sharmika Chechare, Senior Lecturer, Dept of Conservative Dentistry and Endodontics, Pravara Rural Dental College, PIMS, Maharashtra, India.

[6]Dr. Priti Kendre, Postgraduate, Dept of Conservative Dentistry & Endodontics, YCMM and RDF'S Dental College, Ahmednagar, Maharashtra, India.

Corresponding Author: Dr. Pooja Vinayak Gaikwad, Post graduate student, Dept of Conservative Dentistry & Endodontics, YCMM and RDF'S Dental College, Ahmednagar, Maharashtra, India.

Citation of this Article: Dr. Pooja Vinayak Gaikwad, Dr. Sarvesha Bhondwe, Dr. Vishal Mahajan, Dr. Sonam Muthiyan, Dr. Sharmika Chechare, Dr. Priti Kendre, "Comparative evaluation of effect of rotary file and lentulo spiral usage at different speeds on apical extrusion of calcium hydroxide: An Invitro study", IJDSIR- February - 2022, Vol. – 5, Issue - 1, P. No. 173 – 179.

Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract:

Aim: To compare apical extrusion of calcium hydroxide using rotary file and lentulo spiral at different speeds.

Materials and methods: 25 human mandibular single rooted premolars were used. Root canals were enlarged till F1 Protaper universal file size. Root canals were irrigated with 5.25% sodium hypochloride, 17% EDTA and saline and then tooth were dried with paper points. Each tooth was placed in glass tubes which were covered with Aluminium foil. Specimens were divided into 5 groups (n=5): G1: #20 K file, G2: Protaper universal file at 350rpm, G3: Protaper universal file at 1000rpm, G4: Lentulo spiral at 350rpm, G5: Lentulo spiral at 1000rpm. K-file was used at working length, lentulo spiral and

rotary files were used 2mm short of working length. The apices were inspected for extrusion of calcium hydroxide with operating microscope and were scored. Data was Analyzed using chi-square test.

Results: There was statistically significant differences ($p<0.05$) among file system and lentulo spiral with different speed, with minimum extrusion in K-File(G1) fallowed by protaper systems (G2, G3) and highest extrusion in lentulo spiral systems (G4, G5). Apical extrusion was seen higher ($p<0.005$) at 1000rpm as compared to 350rpm in both protaper system and lentulo spiral system.

Conclusion: Lentulo spirals and rotary files should be used with lower speed in clinical practice to avoid extrusion of calcium hydroxide.

Keywords: calcium hydroxide, lentulo spirals, rotary files, rpm, apical extrusion.

Introduction

Removal of micro-organisms thoroughly is not possible by instrumentation alone in root canal treatment. So chemical disinfection and irrigation is mandatory for complete elimination of micro-organisms and their by products[1].

Calcium hydroxide is most frequent endodontic intracanal dressing material and pulp capping agent[2] because of its beneficial benefits including antibacterial property, high Ph and induction of hard tissue formation[3]. It is highly known for its therapeutic effectiveness and its broad range antibacterial action which proportionate to its ability of hydroxide ions after being discharge from calcium hydroxide to diffuse into dentin and its extensive usage. It is commonly used as both short- and long-term intracanal dressings[4,5]

Regardless of being safe agent, it also have some side effects like inflammatory response, cytotoxicity on cell cultures, the neurotoxic potential of root canal sealers, osteonecrosis in repaired perforations damaged epithelium with or without a cellular atypia and cellular damage following early Ca (OH)2 placement of avulsed teeth and also it has side effects when extruded apically under pressure[6,7].

The placement of Ca (OH)2 is performed in various ways such as lentulo spirals, K-files, McSpadden compactors, amalgam carriers, reamers, ultrasonic and sonic files, absorbent paper points, gutta-percha cones, syringe, and 27-G long needles[8].

The aim of the study was to compare apical extrusion of calcium hydroxide using rotary file and lentulo spiral at different speeds.

Objective of the study was to compare apical extrusion of calcium hydroxide by lentulo spiral and rotary files and to compare apical extrusion of calcium hydroxide by rotary files and lentulo spiral at different speeds.

Materials and methods

- 25 Extracted Mandibular Premolars
- Airotor
- Round bur
- Safe end bur
- K files
- Endo bloc
- Endo motor
- Protaper
- Syringe
- Saline
- Sodium Hypochlorite
- EDTA gel
- RC Cal
- Lentulo spiral

Twenty-five extracted human mandibular teeth with straight roots, fully developed apices and almost equal length were selected for the study. Endodontic Access

cavities were prepared with diamond coated burs and a high-speed hand piece in each tooth. The working length was determined by subtracting 1 mm from the length at which the tip of a file could be visible just extending beyond the apical foramen.

The ProTaper (Dentsply) rotary file system was used to mechanically prepare the root canals according to the manufacturer's instructions. Root canals were irrigated with 5.25% sodium hypochloride, 17% EDTA and saline. A #10 K-file was used to check patency of the apical foramens. Final irrigation was performed with 5-mL of 17% EDTA solution for 30 seconds, 5-mL flush of 5.25% NaOCl, and 5-mL of saline solution. Then, the root canals were dried with absorbent paper cones. Each teeth were placed in glass tubes which were covered with aluminium foil for masking the procedure.

Specimens were divided into 5 groups (n=5):

G1: #20 K file,

G2: Protaper universal file at 350rpm,

G3: Protaper universal file at 1000rpm,

G4: Lentulo spiral at 350rpm,

G5: Lentulo spiral at 1000rpm.

K-file was used at working length, lentulo spiral and rotary files were used 2mm short of working length. The apices were inspected for extrusion of calcium hydroxide with operating microscope and were scored. Data was analyzed using chi-square test.

Fig 1: Glass vial.

Fig 2: Aluminium foil on glass vial.

Fig 3: Placement of tooth on glass vial to mask the procedure.

Scoring criteria

Fig-4: Absence of ca(0H)2 in the apex.

Fig-5: Visible ca(0H)2 in the apex, but there was no extrusion.

Fig-6: There was extruded ca (OH)2.

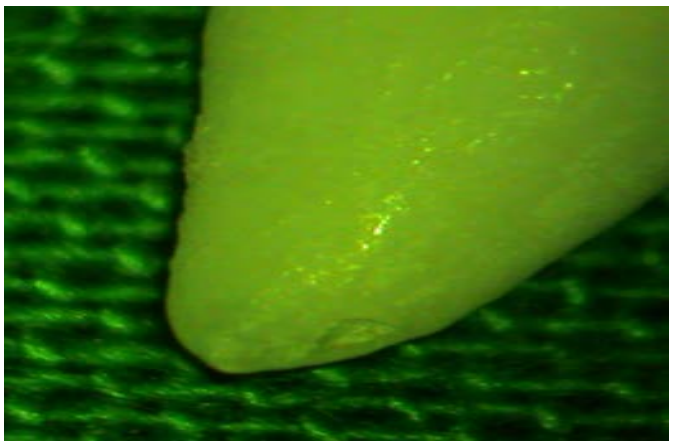

Fig 4: Absence of ca(0H)2 in the apex.

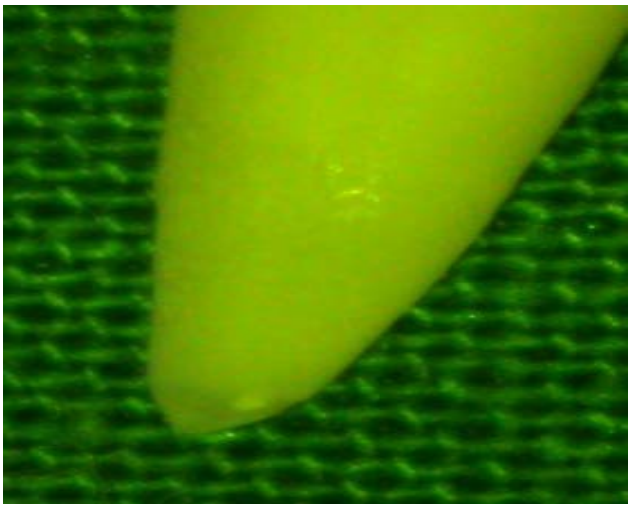

Fig 5: Visible ca(0H)2 in the apex, but there was no extrusion.

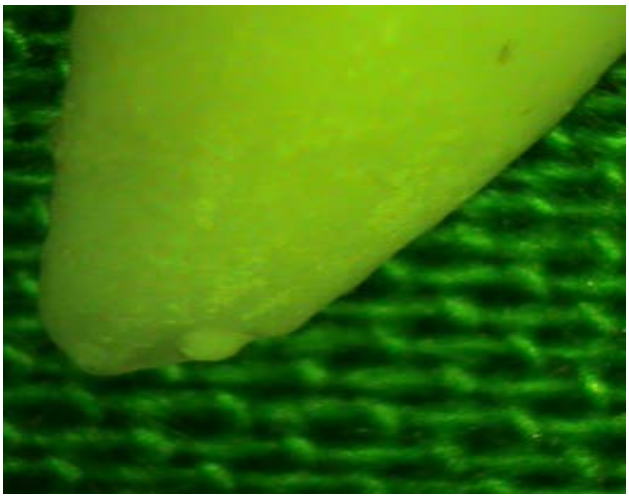

Fig 6: There was extruded ca (OH)2.

Table 1: Comparative evaluation of apical extrusion scores among five different file systems

	Score 0 n (%)	Score 1 n (%)	Score 2 n (%)
Group G1 (K File)	3 (60%)	2 (40%)	0(0%)
Group G2 (Protaper 350 rpm)	2 (40%)	3 (60%)	0 (0%)
Group G3 (Protaper 1000 rpm)	0 (0%)	4 (80%)	1 (20%)
Group G4 (Lentulospiral 350 rpm)	1 (20%)	1 (20%)	3 (60%)
Group G5 (Lentulospiral 1000 rpm)	0 (0%)	1 (20%)	4 (80%)
	Chi square test = 17.008, p =0.03*		

*p<0.05 – significant difference.

Graph 1

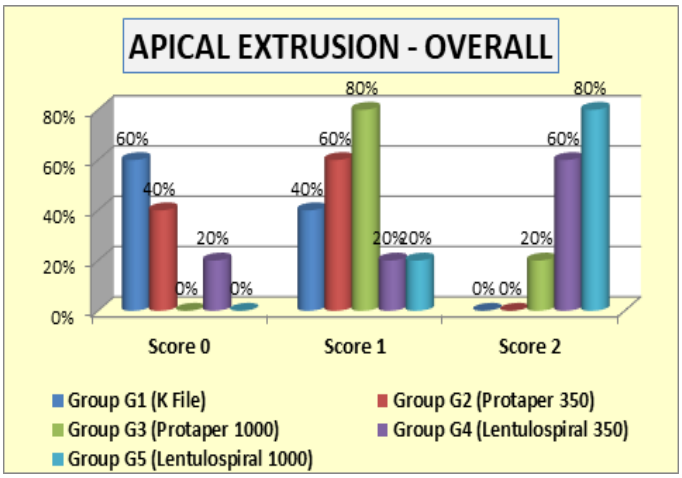

Table 2: Comparative evaluation of apical extrusion scores among protaper files at different speeds.

	Score 0 n (%)	Score 1 n (%)	Score 2 n (%)
Group G2 (Protaper 350 rpm)	2 (40%)	3 (60%)	0 (0%)
Group G3 (Protaper 1000 rpm)	0 (0%)	4 (80%)	1 (20%)
	Chi square test = 11.48, p =0.016*		

*p<0.05 – significant difference.

Graph 2

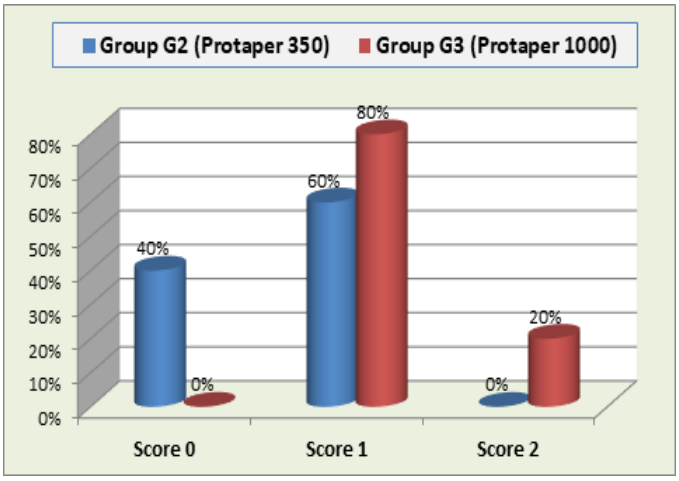

Table 3: Comparative evaluation of apical extrusion scores among Protaper files at different speeds.

	Score 0 n (%)	Score 1 n (%)	Score 2 n (%)
Group G4 (Lentulospiral 350 rpm)	1 (20%)	1 (20%)	3 (60%)
Group G5 (Lentulospiral 1000 rpm)	0 (0%)	1 (20%)	4 (80%)
	Chi square test = 9.132, p =0.032*		

*p<0.05 – significant difference.

Graph:3

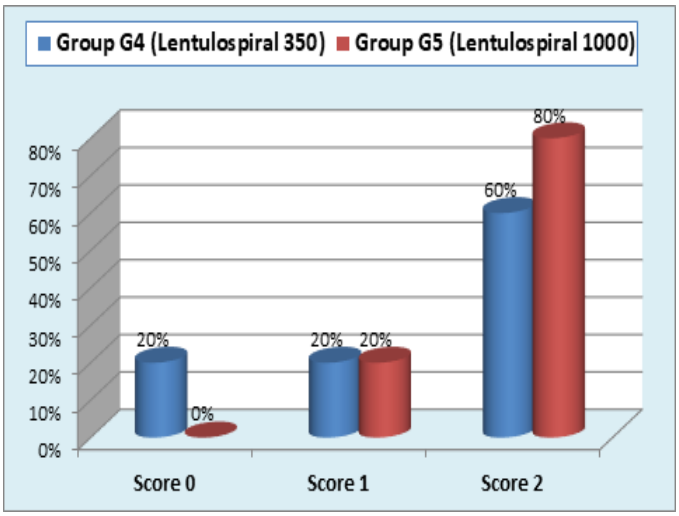

Table 4

	Score 0 n (%)	Score 1 n (%)	Score 2 n (%)
Group G4 (Lentulospiral 350 rpm)	1 (20%)	1 (20%)	3 (60%)
Group G5 (Lentulospiral 1000 rpm)	0 (0%)	1 (20%)	4 (80%)
	Chi square test = 9.132, p =0.032*		

*p<0.05 – significant difference

Discussion

Delivery of calcium hydroxide can be done by variety of methods in root canal systems which includes hand instruments, rotary instruments, and sonic and ultrasonic devices. The hand instruments includes K–files, Flex-O-files, paste carriers, amalgam carriers, and paper points, pluggers, spreaders; the rotary instruments includes paste carriers (lentulo spirals), Paste Inject (Micro Mega), rotary nickel titanium (Ni-Ti) files and McSpadden Compactor; the sonic and ultrasonic devices includes ultrasonic files (Micro Mega®) and sonic activation through Endo-Activator (Dentsply) devices[8].

Lentulo spiral are used in clockwise direction for placement of calcium hydroxide. There is no certain knowledge about its size and shape to be used however, it can be said that it has a push forward effect on the material due to clockwise rotation.

Torres et al. suggested selecting a lentulo spiral that is easily placed to the working length without binding the canal walls[9]

Deonizio et al. used lentulo spiral at 3 mm short from the working length[10].

Estrela C et al. compared the effectiveness of a hand file, rotary file, and lentulo spirals in stimulated curved canals and concluded that the most effective way for

delivering the medicament till the apical thirds in curved canals was by rotary file operating in counterclockwise direction. This was possibly because of high flexibility of Ni-Ti files which allowed more effective and dense delivery in curved canals[11].

Calcium hydroxide placement devices if not used at proper speed, can cause extrusion and some negative effects.

Deveaux et al. preferred the speed of 500 rpm[12]; whereas, Caliskan et al. only entitled as low and moderate speeds, without particularizing it[13]. Deonizio et al. used 5000 rpm, 10000 rpm and 15000 rpm in their experimental groups.

Therefore, in present study rotary files and lentulo spirals were used at 350 rpm and 1000 rpm, speed were established according to maximum feasible speeds in Endo motor.

There was significant differences ($p<0.05$) among file system and lentulo spiral with different speed, with minimum extrusion in K-File(G1) fallowed by protaper systems (G2, G3) and highest extrusion in lentulo spiral systems (G4, G5). Apical extrusion was found higher ($p<0.005$) at 1000rpm as compared to 350rpm in both protaper system and lentulo spiral system.

There were some limitations in this in vitro study. One of them was absence of clinical senerio like physical back pressure provided by periapical tissues in healthy periodontium and teeth. The other limitation was the use of lentulo spiral in a constant distance from the apex. Not only the lentulo spiral speeds have an effect on extrusion, but also the length that of lentulo spiral might have an effect on extrusion Besides, different canal and apex morphologies also might have an effect on the extrusion of Ca (OH)2.

Conclusion

- Minimum extrusion was seen with K-File.
- Rotary files showed minimum extrusion than lentulo spirals
- Rotary files and lentulo spirals should be used with lesser speed in clinical practice to avoid extrusion of calcium hydroxide.

Reference

1. ASLAN T, DÜZGÜN S, ÜSTÜN Y. Effect of Lentulo Spiral Usage at Different Speeds on Apical Extrusion of Calcium Hydroxide. Atatürk Universities Diş Hekimliği Fakültesi Dergisi. 2018 Apr 22;28(2):133-7.

2. Yoshiba K, Yoshiba N, Iwaku M. Histological observations of hard tissue barrier formation in amputated dental pulp capped with α-tricalcium phosphate containing calcium hydroxide. Dental Traumatology. 1994 Jun;10(3):113-20.

3. Zmener O, Pameijer CH, Banegas G. An in vitro study of the pH of three calcium hydroxide dressing materials. Dental Traumatology. 2007 Feb;23(1):21-5.

4. Brännström M, Vojinovic O, Nordenvall KJ. Bacteria and pulpal reactions under silicate cement restorations. The Journal of prosthetic dentistry. 1979 Mar 1;41(3):290-5.

5. Brännström M, Vojinovic O, Nordenvall KJ. Bacteria and pulpal reactions under silicate cement restorations. The Journal of prosthetic dentistry. 1979 Mar 1;41(3):290-5.

6. Lindgren P, Eriksson KF, Ringberg A. Severe facial ischemia after endodontic treatment. Journal of oral and maxillofacial surgery. 2002 May 1;60(5):576-9.

7. De Bruyne MA, De Moor RJ, Raes FM. Necrosis of the gingiva caused by calcium hydroxide: a case report. International endodontic journal. 2000 Jan 1;33(1):67-71.

8. Estrela C, Estrela CR, Barbin EL, Spanó JC, Marchesan MA, Pécora JD. Mechanism of action of sodium hypochlorite. Brazilian dental journal. 2002; 13:113-7.

9. Torres CP, Apicella MJ, Yancich PP, Parker MH. Intracanal placement of calcium hydroxide: a comparison of techniques, revisited. Journal of endodontics. 2004 Apr 1;30(4):225-7.

10. Deonízio MD, Sydney GB, Batista A, Estrela C. Root canal filling with calcium hydroxide paste using Lentulo spiral at different speeds. Dental Press Endod. 2011 Apr;1(1):58-63.

11. Estrela C, Mamede Neto I, Lopes HP, Estrela CR, Pecora JD. Root canal filling with calcium hydroxide using diferent techniques.

12. Deveaux E, Dufour D, Boniface B. Five methods of calcium hydroxide intracanal placementAn in vitro evaluation. Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology. 2000 Mar 1;89(3):349-55.

13. Caliskan MK, Turkun MU, Turkun LS. Effect of calcium hydroxide as an intracanal dressing on apical leakage. International endodontic journal. 1998 May 1;31(3):173-7.

14. Deonízio MD, Sydney GB, Batista A, Estrela C. Root canal filling with calcium hydroxide paste using Lentulo spiral at different speeds. Dental Press Endod. 2011 Apr;1(1):58-63.