Research Article

JRAD Journal of Research and Advancement in Dentistry

J Res Adv Dent 2019;9:2:208-214.

Comprehensive Evaluation of General Dentists Knowledge and Awareness Regarding Usage of Rotary Endodontic Instruments for Various Endodontic Procedures: An Original Research Study

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ABSTRACT

Background: As we all are aware that ultimate success of any endodontic therapy solely depends upon endodontic instruments used for preparing root canal. All these instrumentations have a crucial effect on treatment outcome. The aim of this study was to evaluate the current knowledge and awareness of general dentists regarding intricate usage of rotary endodontic instruments for various endodontic procedures.

Materials & Methods: This study was completed the ideology of a typical cross sectional concept. A logically framed questionnaire was used to gather the response data. A total of 230 private dental practitioners of Lucknow district, India were initially approached for the study. However after considering other overwhelming factors, this number were further reduced to 100. Authors have genuinely attempted this study by close ended questionnaire having questions about rotary endodontics and related instrumentations. All observed data and outcomes were registered and data was processed statistically to evaluate the real-time knowledge and awareness levels.

Results: Statistical analysis was completed using statistical software 'Statistical Package for the Social Sciences (SPSS)'. Authors have ensured the maximum accuracy of results by using appropriate statistical tests that have provided p values, mean, standard deviation, standard error an 95% CI. $P \leq 0.05$ was considered as statistically significant. 91 dentists think that rotary endodontic instruments are efficient in maintaining root canal anatomy & debris removal. 88 dentists think that rotary endodontic instruments provide a faster root canal preparation & it's time saving also. 65 dentists think that rotary endodontic instruments are efficient in removal of filling material during retreatment.

Conclusion: Within the limitations of the study authors concluded that dentist's knowledge and awareness about rotary endodontics was rationally fair. Because rotary endodontics is a modern technological advancement, repeated educational events and procedural demonstrations should be conducted to revamp the present knowledge of clinicians.

Received: Nov. 3, 2018: **Accepted**: Feb. 21, 2019

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pISSN 2278-0076
eISSN 2321-9270

Keywords: Rotary endodontics, Awareness, Knowledge, Rotary instruments.

INTRODUCTION

The basic objective of any endodontic therapy is to prevent or cure apical pathologies. Endodontic instruments play a vital role in the success of endodontic therapy. Their contribution starts from the access preparation and ends somewhere around the final obturation of the root canal. Literature has well shown that fundamental aim of root canal preparation is to shape and clean the root canal spaces efficiently.[1-2] Different pioneer workers have shown and discussed different kinds of instruments and techniques for this crucial phase of root canal therapy. Recent past has well evidenced and illustrated fabulous advancements in root canal techniques and instruments. Formerly, biomechanical preparation of root canals was completed by stainless steel hand files. Nickel Titanium is one of the revolutionary materials that have actually changed the entire face of modern Endodontics.[3] Nickel Titanium and its alloys had been initially used to manufacture manual/hand root canal instrument followed by manufacturing of rotary endodontic instruments. As shown by most of the studies, enhanced and effective apical clean-up, is now possible with the next generation modern rotary nickel–titanium instruments. When compared to stainless steel instruments, Nickel Titanium armamentariums have adequate clean-up capability while preserving the root canal morphology.[4] The astonishing characteristics of nickel–titanium instruments are their super-elasticity and strength. Because of such user friendly properties, it is actually possible to construct rotary instruments with double, triple and quadruplet taper compared to the traditional standard.[5-6] Apart from super-elasticity and strength; they also exhibit higher resistance to torsional fracture due to their enhanced ductility. Few of the complications have also been noticed in clinical usages of Nickel Titanium armamentariums that includes primarily Nickel Titanium file fracture. When comparing rotary instrumentations with hand instrumentations, operator can observe improved ability to collect and remove debris from the root canal in rotary system. Additionally, uninterrupted clockwise rotation would redirect debris only in a coronal direction from the apical foramen.[7] Also, continued rotation results into reduction of overall instrumentation time and chair time. It is therefore, to enhance the effectiveness and to diminish the dilemmas of present rotary endodontic systems; parent companies keep bringing up newer systems or amendments from time to time. Thus, there is a need to assess the current knowledge and awareness of general dentists regarding usage of rotary endodontic instruments. The aim of this study was to evaluate the current knowledge and awareness of general dentists regarding intricate usage of rotary endodontic instruments for various endodontic procedures.

MATERIALS & METHODS

The present study was conducted to evaluate the current knowledge and awareness of general dentists regarding intricate usage of rotary endodontic instruments for various endodontic procedures in Lucknow district, India. The authors have finalized to complete this study on a cross sectional and questionnaire philosophy. Authors have literally evaluated total 100 private dental practitioners of Lucknow district, India. Initially, 230 registered private dental practitioners were targeted. However, on further scrutinizing and screening we noticed that 60 were not actively practicing, rest remaining was 170. Upon actual execution of the study and questionnaire exercise, we found that 70 of them not reverted to our questionnaire professionally because of various grounds. Accordingly, final sample included in the study was total 100 the general dental practitioners of Lucknow district, India. Informed consent was achieved from the studied dentists those were voluntarily ready for participation. The significance of this study was explained in detail to all participating dental practitioners. We worked and processed questionnaire feedback data of 100 clinicians competently. Authors have already prepared questionnaire having 8 relevant questions about rotary endodontic. The copies of questionnaire were delivered to the participating dentists at their clinics/working places. They were also requested to respond in complete bias free manner. Authors had handed over this questionnaire to the studied clinicians at their work

places. We have decided to conduct this study on questionnaire idea as they are extremely valuable in obtaining all-inclusive information about personal and group perceptions and opinions. Moreover, questionnaire based studies also provide a wide range of data with enhanced clearness and understanding. Rights of the studied dentists including privacy policy were completely ensured. Results thus obtained was tabulated and subjected to basic statistical analysis. P value less than 0.05 was considered significant ($p< 0.05$).

RESULTS

Questionnaire feedback responses were sent for statistical analysis using statistical software Statistical Package for the Social Sciences version 21 (IBM Inc., Armonk, New York, USA). The consequential data was subjected to suitable statistical tests to obtain p values, mean, standard deviation, chi- square test, standard error and 95% CI. Table 1 and Graph 1 confirm that out of 100 studied dentists, males were 63 and females were 37. Total 11 dentists were in the age group of >65 years. Total 24 practitioners were belonging to the age range of 41-50 years. 23 studied dentists were falling in the age range of 31-40 years and 61-65 years. P value was significant in group II of age range 41-50 years [0.02]. Evaluation of practitioners according to their educational degree revealed that 69 dentists possess dental undergraduate degree while 30 were having dental post graduate degree [Table 2]. Questionnaire evaluation showed significant results wherein p value was also found to be significant (Table 3). 75 dentists think it is a revolutionary innovation in endodontics. 91 dentists think that rotary endodontic instruments are efficient in maintaining root canal anatomy & debris removal. 88 dentists think that rotary endodontic instruments provide a faster root canal preparation & it's time saving also. 65 dentists think that rotary endodontic instruments are efficient in removal of filling material during retreatment. 51 dentists attempted endodontic procedure (successfully) in inaccessible areas using rotary instruments instead of manual. Table 4 illustrates fundamental statistical description with level of significance evaluation using 'Pearson Chi-Square Test' for all 8 screened questions. Analyzed question no 3, 5 and 7 exhibited significant levels ($p<0.05$ significant).

Table 1: Age & gender wise allocation of practitioners.

Age Group (Yrs)	Male	Female	Total %	P value
31-40	13	10	23 [23 %]	0.08
41-50	17	7	24 [24 %]	0.02*
51-60	9	10	19 [19 %]	0.50
61-65	14	9	23 [23 %]	0.09
>65	10	1	11 [11 %]	0.06
Total	63	37	100%	*Significant

*p<0.05 significant

Table 2: Evaluation of practitioners by educational degree.

Educational Degree	Number	Mean	Standard Deviation
Undergraduate [BDS]	69	15.96	17.94
Post Graduate [BDS+MDS]	30	7.57	14.76
BDS+MDS+Ph.D	1	1.79	3.85
Total	100	-	-

Table 3: Questionnaire Assessment with Related Statistical Inferences.

Questionnaire	Variables	Responses of Practitioners [Yes]	Responses of Practitioners [No]	p Value
1	Are you aware about rotary endodontics ?	93	7	0.020*
2	Do you think it is a revolutionary innovation in endodontics ?	75	25	
3	Do you think that rotary endodontic instruments are efficient in maintaining root canal anatomy & debris removal?	91	9	
4	Do you think that rotary endodontic instruments provide a faster RC preparation & it's time saving too ?	88	12	
5	Do you think that rotary endodontic instruments are effective in reducing patients stress ?	55	45	
6	Do you think that rotary endodontic instruments are efficient in removal of filling material during retreatment ?	65	35	
7	Have you ever attempted endodontic procedure (successfully) in inaccessible areas using rotary instruments instead of manual ?	51	49	
8	After completion of this questionnaire/study; are you keen to receive regular updates/news about rotary endodontics?	82	18	

***p<0.05 significant**

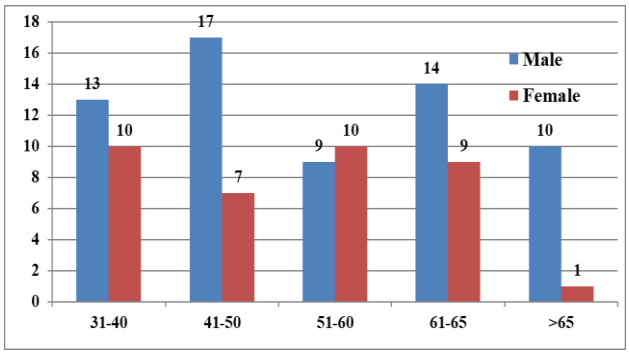
Table 4: Fundamental statistical description with level of significance evaluation using 'pearson chi-square test'**.**

Question No.	Mean	Std. Deviation	Std. Error	95% CI	Pearson Chi-Square Value	df	Level of Significance (p value)
1	2.35	0.542	0.260	1.96	2.335	2.0	0.326
2	2.76	1.080	0.040	1.96	2.254	1.0	0.0690
3	2.43	1.985	0.588	1.96	2.124	1.0	0.020*
4	2.98	0.975	0.043	2.45	1.348	1.0	0.320
5	3.34	1.453	0.025	1.96	2.564	2.0	0.000*

6	2.36	0.182	0.087	1.65	2.879	1.0	0.455
7	2.32	1.085	0.076	1.76	1.264	1.0	0.000*
8	2.63	0.343	0.085	1.96	2.783	2.0	0.787

***p<0.05 significant**

Graph 1: Age & gender wise allocation of practitioners.



DISCUSSION

Introduction of Ni-Ti alloy has enabled great advancements in the design of new endodontic instruments, such as taper and cut angles variations. The instrument design and the technique severely influence the final quality of the root canal shaping. Additionally, it is almost difficult to wholly eliminate the risk of errors and accidents; nonetheless, the dentists should aim to lower these happenings.[8-10] The presence of nickel titanium alloy in rotary instruments' composition not only enabled a lower number of preparation defects. Literature have well evidenced about different generation and successive developments of rotary endodontic systems. Generation one instruments were initially introduced in the market in 1993 with file name of Profile. It was having non cutting tip and fixed taper of 2, 4 and 6 percent with negative rake angles and passive cutting blades. Their evaluation was continued until Flex Master introduced in year 2000. Second generation rotary files were introduced around 1999 to 2004 and included primarily Race, Protaper , K3, Hero Shaper, EndoSequence. Third generation rotary endodontic systems developed with new feature of safety tips. They were primarily Hyflex, Wave-one and Twisted. Fourth generation rotary systems developed from 2010 and included mainly self adjusting files, Revo-S and Proteper Next. Self adjusting files were having pointed cylinder tip with compressible open tube design for up/down & back/froth motions. Khasnis and co workers in their recent study concluded that right selection of file by the operator, would balance the conflict between fatigue properties of the alloy, enabling a more proficient preparation of the canal with diminished risk of separation. Panchal and associates did a study (randomized control trial using pulpectomy) with aim to compare the obturation quality and instrumentation time after root canal instrumentation with rotary Kedo-S files, hand K-files, and H-files in primary molars. They have concluded that pediatric rotary files Kedo-S has better obturation quality in minimum instrumentation time. Karnik and colleagues did a study in 2016 wherein they showed an innovative technique of separation of accidentally lodged rotary endodontic file into the dentist's thumb during procedure.[11-23] As per the responses obtained in the present study, we can expect lowered stress levels in patients by using rotary instruments. Moreover, our 88 % studied dentists think that rotary endodontic instruments provide a faster root canal preparation & it's time saving also. This actually poses a positive scenario about overall usage and efficiency of rotary instruments. Nevertheless, file fracture has also been reported in the literature as a clinical dilemma of rotary instrumentation. In 2002, Yared and Kulkarni confirmed the instruments' fracture index in relation to different torque levels (high, moderate, low) during root canal preparation performed by experienced and inexperienced professionals. The authors noticed that inexperienced professionals reached a lower fracture level when root canal shaping was performed with low torque. This index was also low when experienced professionals employed high or moderate torque during root canal preparing, confirming the importance of controlled and constant torque in addition to the professional experience, which is achieved only with clinical practice.[24] Therefore, in an attempt to reduce the fracture chances, the discard of instruments after a number of uses must be logically considered.

CONCLUSION

Results of this study very clearly showed the present state of knowledge/awareness of studied dental practitioners about rotary endodontics. Within the limitations of the study authors have concluded that knowledge and awareness of studied dentists about rotary endodontics was rationally fair. Because rotary endodontics is a modern technological advancement, repeated educational events and procedural demonstrations should be conducted to revamp the present knowledge of clinicians. The inferences of this study should be considered as evocative for presuming clinical outcomes of crucial conditions. However, we anticipate some other large scale studies to be performed that could further establish few authentic guidelines in these regards.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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