

KAP Survey On The Reuse Of Rotary Systems Used By Dental Practitioners, Endodontists, And Postgraduates

Research Article

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Abstract

The preference and usage of nickel titanium rotary instruments varies from individual to individual based on their technique, experience with the rotary systems and the clinical situation. Very limited information is available to explain the adoption of changing concepts with respect to nickel titanium rotary instruments pertaining to the endodontists in India. This is a comparative and descriptive study for which the data was obtained from the responses given by the participants of a survey circulated through an online platform. The data collection was from the dental practitioners, Endodontists, and post graduates in Tamilnadu. The data was collected and compiled followed by its statistical analysis by using the SPSS software by IBM. The aim of this study was to conduct a questionnaire survey to acquire the reuse of rotary systems by dental practitioners, Endodontists, and post graduates.

Keywords: Rotary Instruments; Knowledge; Awareness; Dental Practitioners; Reuse; Postgraduates.

Introduction

Root canal treatment is one of the most technically challenging procedures in dentistry and the success depends on the diagnostic acumen, instruments used and the technologies adopted. The adoption of endodontic nickel-titanium rotary technology by endodontists in India has increased two folds in the last two decades. Dental caries are easily detectable and reversible at an early stage. The management of such a condition calls for a comprehensive approach to identifying the cause and treating it [1]. Although all endodontists use rotary technology there is a significant disparity in the different systems used, frequency of use and the methods of use [2]. A survey was conducted to understand the usage of rotary instruments by endodontists in Chennai, India.

Endodontic treatment encompasses procedures that are designed to maintain the health of all or part of the pulp [3]. When the pulp is diseased or injured, treatment is aimed at preserving normal periradicular tissues. Root canal treatment is done when caries have spread the infection to the periradicular region [4].

Cleaning and shaping of the root canal system is one of the main goals in endodontics which can be carried out using different systems and techniques [5]. Traditionally, stainless steel used in the manufacturing of hand instruments for root canal shaping lacks flexibility with increasing sizes and can lead to procedural errors [6] resulting in a decreased success rate for endodontic treatment [7].

In 1988, root canal instruments manufactured from nickel-titanium (NiTi) alloy were introduced to overcome the rigidity of stainless steel [8]. NiTi is one of several shape memory alloys, but this particular alloy of two metals has the most important particular applications in medicine and dentistry due to its biocompatibility and corrosion resistance [5]. NiTi alloy was discovered by Buehler HM et al., and named Nitinol which stands for nickel, titanium, Naval Ordnance Laboratory [9]. In endodontics, NiTi was initially reported for use by Walia HM et al., [9].

Rotary instruments, especially nickel titanium ones, have the advantage of instrumentation with reduced errors during treatment.

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They are much more flexible and have greater resistance to torsional fracture when compared to stainless steel files.[10]. Various NiTi rotary systems are being constantly released. Continuous improvements have been made to the design of the instrument with the implementation in the hope of achieving better and safe shaping with reduced risk of procedural accidents, such as transportation or file separation [11,12]. Further, Correct knowledge of intracanal medicaments would help the practitioners to decide the apt material of choice as intracanal medicaments in different clinical situations [13,14].

Further, there is a perception among endodontists and researchers that the number of times an instrument is used may be an important factor in the treatment failure rate[13] .

The introduction and development of nickel-titanium rotary instruments is undoubtedly a quantum leap for the field of endodontics[15] . Experienced endodontists in the use of rotary instruments feel that each file system has its own definite set of characteristics i.e, advantages and disadvantages and the particular rules for its usage are supposed to be followed[15,16].

Very limited information is available regarding the adoption of nickel-titanium rotary instruments and instrumentation by endodontists in chennai, India.

The objective in performing this study was to conduct a questionnaire survey to acquire knowledge concerning different NiTi rotary instruments and their usage techniques by endodontists in India. The aim of this study was to conduct a questionnaire survey to acquire the reuse of rotary systems by dental practitioners, Endodontists, and postgraduates. Previously our team has a rich experience in working on various research projects across multiple disciplines[17-31]. Now the growing trend in this area motivated us to pursue this project.

Materials And Methods

This study was carried out based on the responses given by the participants of a survey circulated through an online platform. Pros of this study include available data, similar ethnicity. Drawback of this study are the fact that it is a uni-centered study and the geographic locations, trends are not assessed. Approval for the study is by the ethical board of Saveetha University (applied). A number of people involved includes 3 reviewers - A Guide, a researcher, and a reviewing expert This is a retrospective study in which the samples were considered based on the responses given by the survey participants. Data reviewed for the research includes All responses applicable for study and cross-verification of the required data were by a reviewing expert through pho-

tographs. Measures were taken to minimize the sampling bias. These are the inclusion of only clear and readily available data Followed by simple random sampling. Both Internal and external validation was also obtained to carry out the study.

The required data for the study was obtained from responses given by participants of a survey circulated through an online platform(survey planet). The data were collected and entered in a methodical manner in an excel sheet for the tabulation of data and further statistical analysis.

Data were validated by 1-2 external reviewers and all the nonspecific, unclear or incomplete data were excluded from the study.

Statistical software used for analysis is the SPSS (statistical package for the social sciences) by IBM and the statistical tests used were chi-square tests, custom tables, frequency tables, bar graphs to analyze and compare the obtained results. The type of analysis performed was exploratory data analysis. Independent variables include ethnicity, reasons for reusing rotary files, gender, age, and the Dependant variables include rotary files.

Results And Discussion

From the results obtained, we can see that about 19% were corporate practitioners, 28% were solo practitioners,39% under university setting and all others were 14%. (figure 1). About 24% of them use it once a week, 36% of them use it three times a week and 40% of them use it everyday (figure 2). About 89% of them reuse and 11% do not reuse (Figure 3). 24% of them discard after two to three times usage, 61% of them use until it unwinds and 15% of them use until it is fractured (Figure 4). 24% of them discard after two to three times usage, 61% of them use until it unwinds and 15% of them use until it is fractured (Figure 5). 59% of them reuse due to increased cost of instruments, 30% reuse as rotary files are stronger than hand files, 8% reuse because of lesser instr fracture, and 3% reuse for other reasons (Figure 6). 24% of them use it once a week, 36% of them use it three times a week and 40% of them use every day (Figure 7). About 49% said yes and 51% said no when it was asked if frequencies of cost of reprocessing offsets the cost of purchasing new items (Figure 7). About 90% of them said yes and 10% said no when it was asked if the safety and cost-effectiveness of reprocessing procedures of rotary endodontic files in dental practice were satisfactory (Figure 8). The association of type of endodontic practice and reasons for reuse of rotary files was tested. Chi-square tests revealed p-value < 0.05 statistically significant (Figure 9). The association of type of endodontic practice and feeling that cost of reprocessing offsets the cost of purchasing new items was tested. Chi-square tests revealed p-value < 0.05 statistically significant.

Figure 1- Bar graph representation of frequencies of various dentists who pursue dental practice in various setup- x axis represents type of practice and y axis represents the percentage of dentists under each type on a scale of 1-100. 19% were corporate practitioners, 28% were solo practitioners,39% under university setting and all others were 14%.

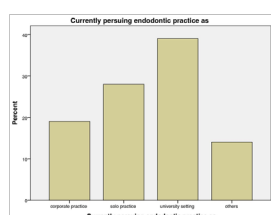


Figure 2- Bar graph representation of frequencies of usage of rotary endodontic files in dental practice - x axis represents how often rotary files are being used and y axis represents the percentage of dentists who use them on a scale of 1-100. 24% of them use once a week, 36% of them use three times a week and 40% of them use everyday.

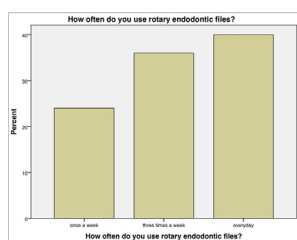


Figure 3- Bar graph representation of frequencies of reuse of rotary endodontic files for different patients after sterilisation in dental practice - x axis represents reuse of rotary endodontic files for different patients after sterilisation and y axis represents the percentage of dentists who reuse them on a scale of 1-100. 89% of them reuse and 11% do not reuse.

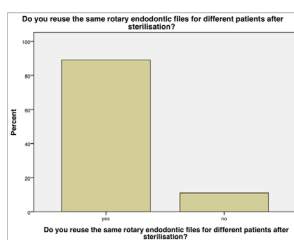


Figure 4- Bar graph representation of frequencies of reuse of same rotary endodontic files in dental practice - x axis represents how often the same rotary files are being reused and y axis represents the percentage of dentists who reuse them on a scale of 1-100. 24% of them discard after two to three times usage, 61% of them use until it unwinds and 15% of them use until it is fractured.

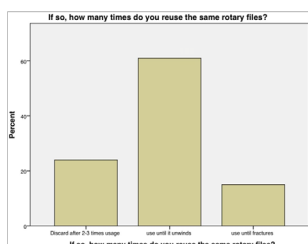


Figure 5- Bar graph representation of frequencies of reason for reuse of rotary endodontic files in dental practice - x axis represents reason for reuse of rotary files and y axis represents the percentage of dentists who reuse them on a scale of 1-100. 59% of them reuse due to increased cost of instruments, 30% reuse as rotary files are stronger than hand files, 8% reuse because of lesser instr fracture and 3% reuse for other reasons.

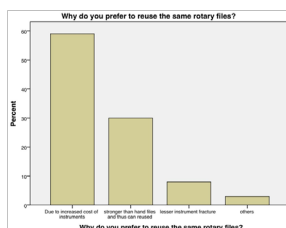


Figure 6- Bar graph representation of frequencies of reprocessed items do not show deterioration and work like a new one - x axis represents how often rotary files are being reused and y axis represents the percentage of dentists who use them on a scale of 1-100. 24% of them use once a week, 36% of them use three times a week and 40% of them use everyday.

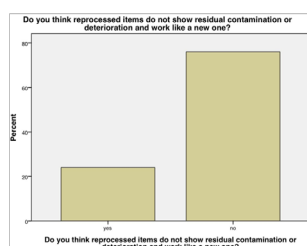


Figure 7- Bar graph representation of frequencies of cost of reprocessing offsets the cost of purchasing new items - x axis represents yes or no and y axis represents the percentage of dentists who said yes or no on a scale of 1-100. About 49% said yes and 51% said no.

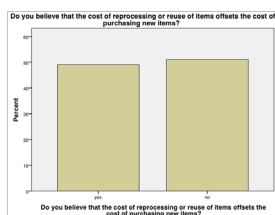


Figure 8- Bar graph representation of frequencies of safety and cost effectiveness of reprocessing procedures of rotary endodontic files in dental practice - x axis represents yes or no and y axis represents the percentage of dentists who are comfortable or not on a scale of 1-100. About 90% of them said yes and 10% said no.

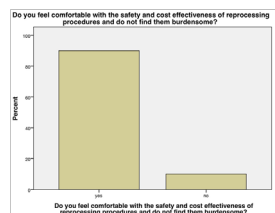


Figure 9- Bar graph depicting association of type of endodontic practice and reasons for reuse of rotary files - x axis represents type of endodontic practice and y axis represents the various reasons for reuse under each category on a scale of 1-100. Chi square tests reveal p value < 0.05 statistically significant.

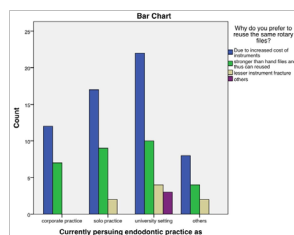
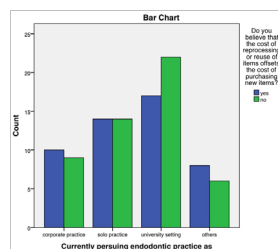


Figure 10- Bar graph depicting association of type of endodontic practice and feeling that cost of reprocessing offsets the cost of purchasing new items - x axis represents and y axis represents the responses of the dentists for reuse of rotary files on a scale of 1-100. Chi square tests reveal p value < 0.05 statistically significant.



This survey was conducted with the intention to collect data from Indian endodontists regarding the usage of different rotary instruments and their usage techniques. Although such survey data are available from other countries, comparatively little is known about the different rotary instruments usage and their techniques in India.

The distribution of the survey forms by the online platform was done. Collection of data, obtained through the electronic media offered a unique advantage of access to large groups, improved participants' response percentages by guaranteed completion of each question by using an incomplete error message for unanswered questions during the submission process [32].

This study had an overall response rate of 63.8%, which was acceptable for dental surveys (50-70%) [33]. The purpose of this

questionnaire survey was to gain insight into the experiences and beliefs of endodontists concerning the new endodontic technology of rotary NiTi instrumentation as the successful introduction of new NiTi rotary technology into daily clinical practice would require not only effective products but also the appropriate and adequate data with quality information for the usefulness of the practitioners. The questionnaire was designed to assess the problems, patterns of usage by endodontists and to identify areas of potential concern. Further, it was intended that the information obtained this way allows a better understanding of the needs within the Indian endodontists.

Experienced operators combine instruments from different file systems and use different instrumentation techniques to achieve the best biomechanical cleaning and shaping results, resulting in the fewest procedural errors.

It is recommended that NiTi rotary instruments be discarded after a single-use. A single-use is ideal for reducing the risk of file separation; however, the high operating cost of NiTi files has forced clinicians to reuse them [34]. There are so many factors governing the safe reuse of NiTi rotary file systems which mainly depends on the number of reuses, preparation technique employed, path of insertion preparation before the rotary instrumentation and initial apical enlargement followed by enlargement of the root canal using hand K files, coronal preparation and the use of adequate amount of irrigant and lubrication with the rotary file system [35].

The technique used for root canal preparation was associated with the frequency of file separation. Operators who use the sequential total length technique tended to experience file fracture more than crown down and hybrid preparation technique. The crown down technique has been used for more effective cleaning and shaping. It minimizes coronal interference, decreases the torque load of each instrument and reduces procedural errors. The hybrid technique does not deviate from the principles of the crown down preparation [36].

Prior to the use of any NiTi rotary instruments, a passive glide path for these instruments up to ISO size 20 with stainless steel K hand files is essential because the fragile tips of small-sized rotary instruments can follow the path created without damage to the canal or cutting. Even light pressure or a small amount of torque with an inadequate glide path would otherwise fracture these instrument tips. So, it is recommended that the use of stainless steel hand files to prepare the apical 1/3rd before introducing rotary files, to reduce the incidence of file breakage.

The frequency of reusing rotary files differed according to experience of the endodontists. Experienced operators had a strong tendency of reusing the files 6-10 times. This was due to the experience-based opinion that a file can be safely reused more. It seems that experienced operators do not rush through a procedure so that it could decrease the chance of torsional failure[37].

Instrument fracture most commonly occurs during root canal preparation when the canal still is rather narrower and not flared. The majority of the fractures had occurred in molars; the most frequently involved root canals were the mesial canals of mandibular molars followed by buccal canals of maxillary molars. The responses obtained were comparatively similar to that of the PenEndo database study[38].

Instrument separation was 33.5 times more likely to occur in the apical one third versus the coronal one-third of the tooth [8]. incidence of file separation decreases with the irrigation protocol and with handpiece having speed and torque control. The galenic form of a lubricant was the main factor to influence mechanical stresses on instruments. Aqueous solutions were superior to a gel-type preparation. Further, the adding a chelating agent causes further decrease in torque and force values. This is almost an immediate effect[39].

The management of separated files is multifactorial, the removal of the fractured NiTi instruments is more influenced by such factors as the anatomy of the tooth, degree of root canal curvature and the location of a fragment than the specific technique used. Management of the separated files was better with experienced endodontists. with the increasing experience.

Although instrument breakage in some cases sharply increases the chance of case failure, it does not in general act as a particularly powerful influence toward case failure. The rather high success rate obtained in spite of instrument breakage suggests that instances of a broken instrument do not have an adverse effect on the prognosis [40].

Examination of root canal instruments before being introduced into a canal is important to make sure that the spiral twists in the files are regularly aligned. If the blades are not spaced equally, it is an indication that the instrument has been strained and that the torque has caused the blades to become irregularly spaced. Instruments with irregularly spaced blades are likely to break. Instruments should also be examined when they are removed from the canal and also prior to sterilization[41]. A quick assessment is sufficient to determine whether the instrument has been under strain and should be discarded or not [42].

The limitations of the study were that the study did not include the questions regarding the advantages of hand over rotary systems, the time consumed by hand over rotary systems and the success rate of conventional files over rotary file systems. It also did not include the questions regarding the sterilization protocols adopted by the endodontists after each use of the rotary files. Other limitations are the Geographic limitations - assessment of predominantly South Indian population. Further, This study is a Unicentered study, which is also a major limitation.

Future prospects of this study include overcoming the limitations and emphasis on Knowledge about the reuse of rotary endodontic files with various parameters, as it is essential for an endodontic practitioner. Increased success rates of root canal treatment is still not a conclusive finding with the rotary instrumentation but there is evidence in the endodontic literature that proves that rotary files have several advantages over conventional hand file systems. The dissemination of the data to the various regions of India gave insight regarding the usage of rotary NiTi instruments and techniques by endodontists in India. The adoption of latest endodontic technologies among endodontists in India has significantly contributed to the betterment of the quality of endodontic treatment. The present survey provided qualitative and quantitative information regarding the various aspects of rotary systems. Questionnaire-based studies can serve as a useful tool in successful practice. Our institution is passionate about high quality evidence based research and has excelled in various fields [43-53]

Acknowledgments And Declaration

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Source Of Funding: Self

Conclusion

Our study assessed the knowledge and awareness of reuse rotary endodontic file systems with various parameters. The overall results show that most of them are reusing the rotary files due to

various reasons. The areas to be emphasized include the sterilization protocols and a standard number of times that a file can be reused.

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