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## A Survey on the use of rotary nickel-titanium endodontic instruments by endodontists in Delhi

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### Abstract

**Aim:** To ascertain the use of rotary Nickel-Titanium instruments by Endodontists in Delhi

**Methodology:** A cross-sectional survey was carried out in March 2020 on 50 endodontists from Delhi. A questionnaire survey was developed comprising of 10 questions to assess their knowledge, awareness of rotary Nickel-Titanium instruments.

**Statistical analysis:** Data were subjected to appropriate statistical measures and analyzed.

**Result:** Among 50 endodontists 32% of endodontists were undergoing post graduation, 42% have an experience of less than 2 yrs after post graduation and 26% have an experience of three yrs and more. The main mentioned reason of rotary NiTi file fracture was overusage (54.14%) followed by excessive pressure on file (32.65%) and then complex root anatomy (10.20%). 66% of endodontists said that they will prefer rotary NiTi files over stainless steel files.

**Conclusion:** Dentists need more training and more comprehensive education regarding NiTi rotary instruments and techniques

**Keywords:** Apical transportation, file fracture, ledging, NiTi, rotary instruments

### Introduction

Endodontics is a major interest in general dental practice. Endodontic treatment encompasses procedures that are designed to maintain the health of all or part of the pulp. When the pulp is diseased or injured, treatment is aimed at preserving normal periradicular tissues. When pulpal diseases have spread to the periradicular tissues treatment is aimed at restoring them to health. This is usually achieved by root canal treatment<sup>[1]</sup>. The success of a canal treatment consists of conserving the original root canal anatomy while avoiding fracture of the instruments during preparation or other iatrogenic processes such as reduction of working length, threshold formation, transport of the apex<sup>[2]</sup>.

Cleaning and shaping of root canal still is a complex procedure that can be difficult for both the dentist and the patient<sup>[3]</sup>. To reach this aim, stainless steel hand instruments have been traditionally applied. Lack of flexibility of instruments causes errors during endodontic treatments<sup>[4]</sup> which lead to decreased success rate<sup>[5]</sup>. After introducing rotary nickel-titanium (NiTi), their usage became popular<sup>[6]</sup>. NiTi instruments super elasticity along with their advanced design made them favorable for effective and safe instrumentation of narrow and curved root canals using low torque handpieces<sup>[4]</sup>. The ability of some NiTi rotary systems in maintaining the root canal curvature has been studied<sup>[7-12]</sup>. Fracture susceptibility is considered as a major disadvantage of these instruments<sup>[3]</sup>.

Thus, the aim of this study was to conduct a questionnaire survey to acquire the knowledge concerning different NiTi rotary instruments and their usage techniques by endodontists in Delhi.

### Materials and methodology

A cross-sectional study was conducted through a whatsapp based questionnaire (Table 1) on 50 dentists who had done their graduation from Delhi. The survey was conducted in two phases (survey tool development and data collection) for a period of 3 days to the contacts of the two investigators.

### Survey tool development

A questionnaire was used for collecting information to describe, compare, or explain demographic characteristics, knowledge, attitude, preference, opinion as well as practical and experiences of the respondents. For 10 questions a 3-point scale was made to analyze the

attitude, awareness, knowledge and skills of dental specialists. To remove any bias the setting of the survey was that one device could only take the survey once.

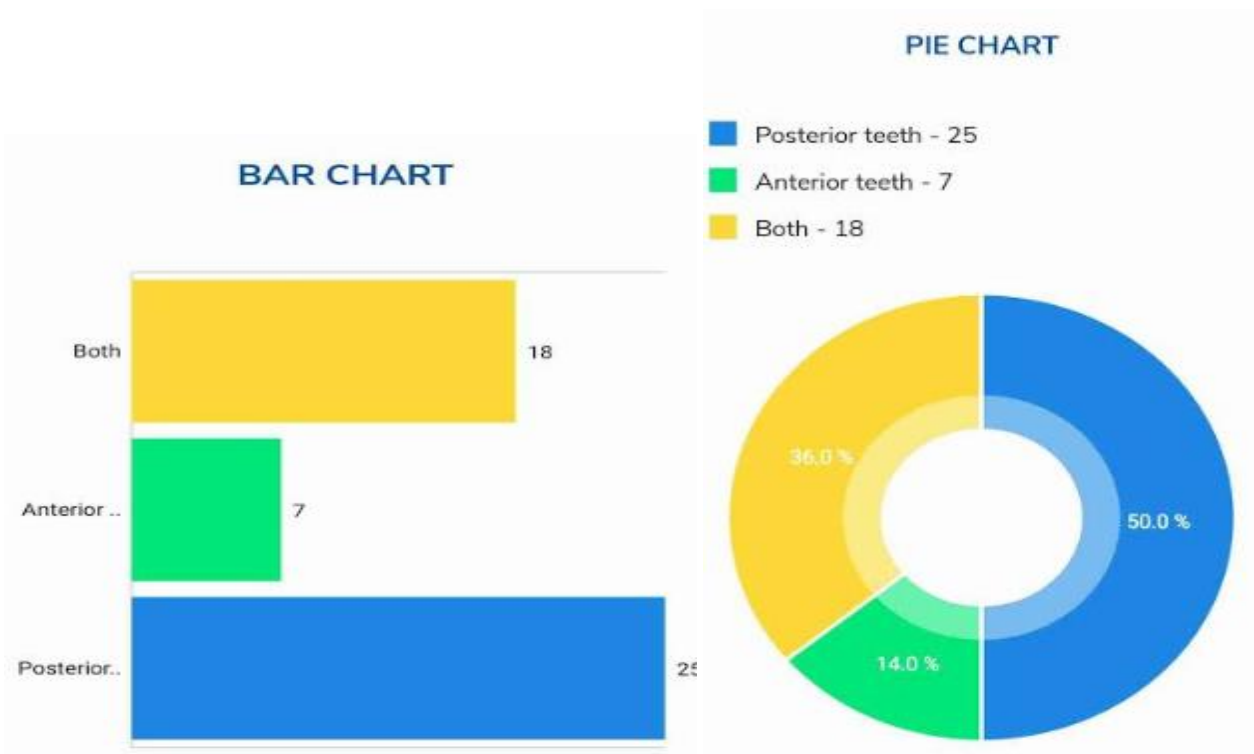
**Statistical analysis**

The Dentists knowledge, skills, preference and attitude were expressed in proportions. The 3-point scale was adapted for each of the following 10 questions.

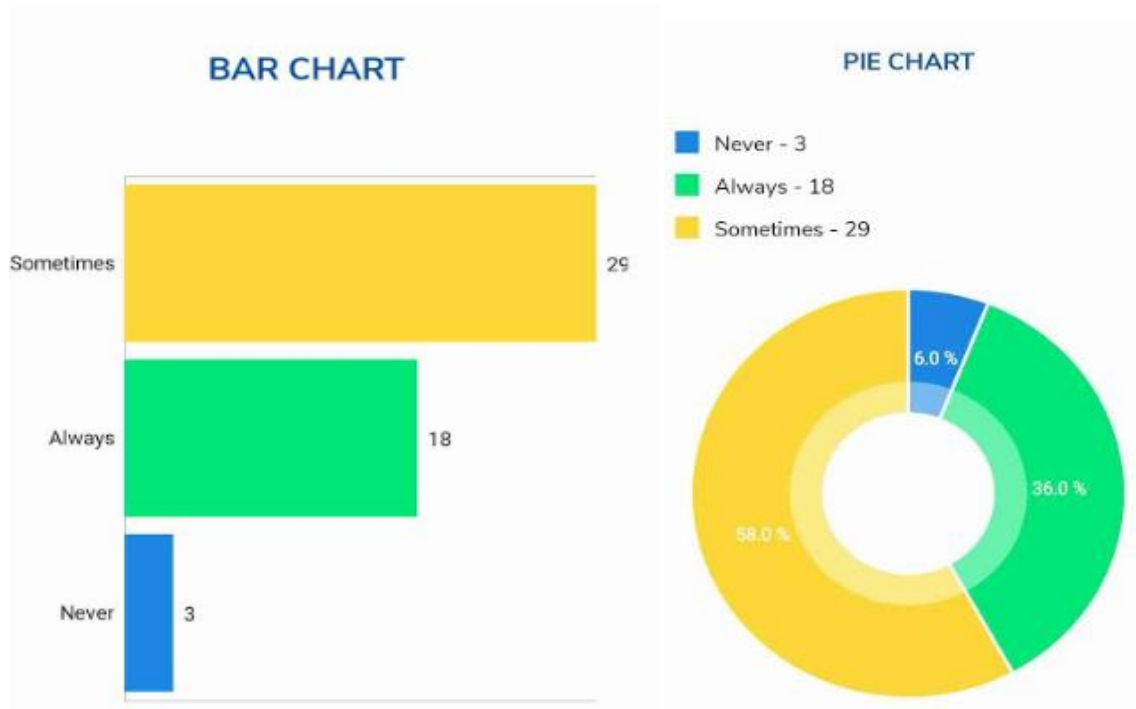
**Results**



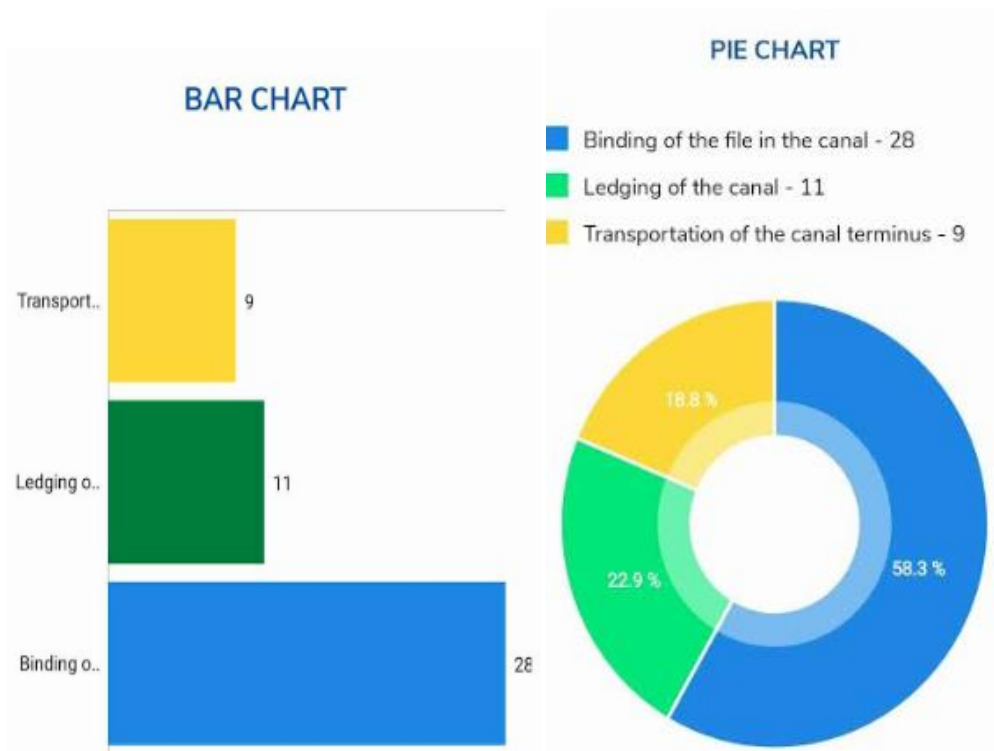
**Fig 1:** Denotes that among 50 endodontists 32% of endodontists were undergoing post graduation, 42% have an experience of less than 2 yrs. after post graduation and 26% have an experience of three yrs and more



**Fig 2:** Denotes that 50% dentists use Rotary Niti files in posterior teeth, 14% in anterior teeth and 36% on both anterior and posterior teeth



**Fig 3:** Denotes that only 6% endodontists never use rotary NiTi instrument for retreatment cases, 36% always use them and 58% use sometimes



**Fig 4:** Denotes that 58.33% endodontists encounter binding of NiTi file in the canal, 22.92% encounter ledging of the canal and 18.75% experience transportation of canal terminus and 2 dentists skipped this question

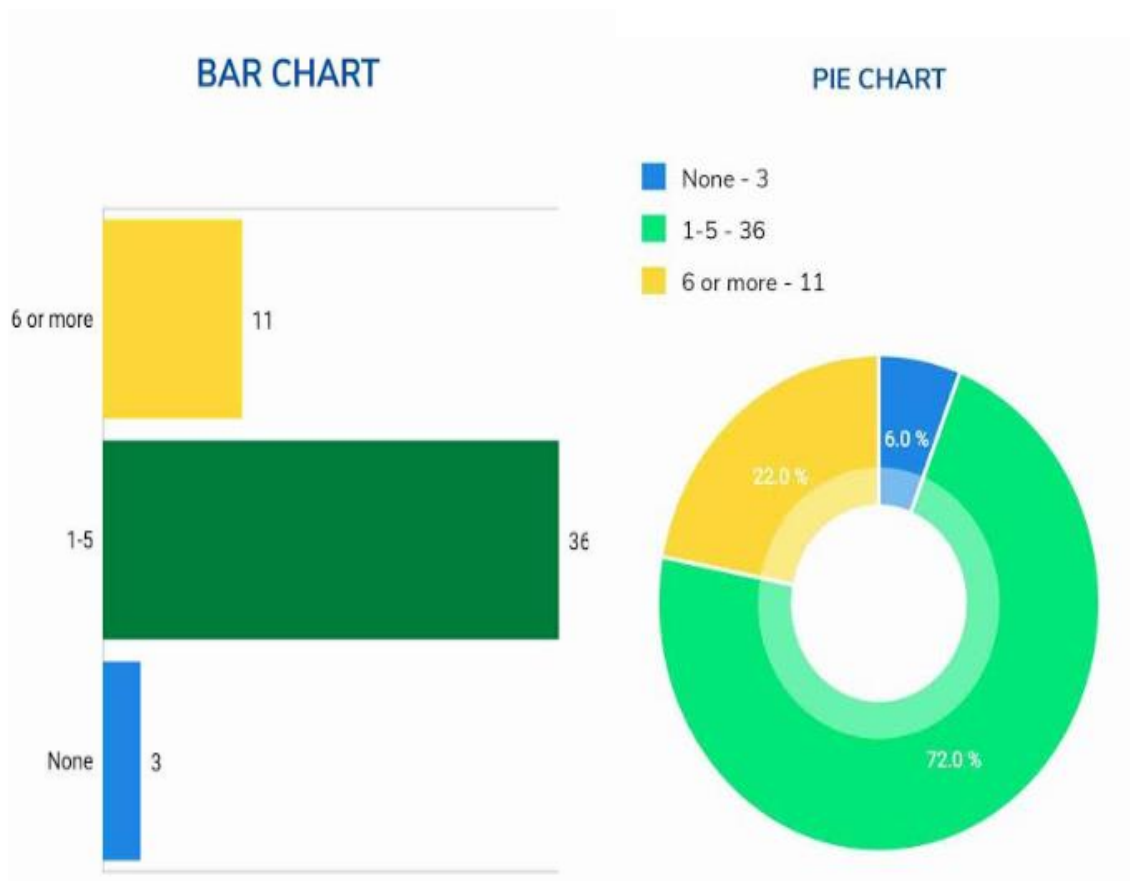


Fig 5: Denotes that 6% endodontists experience no incidence of file fracture, 72% experience 1 to 5 times and 22% 6 or more times.

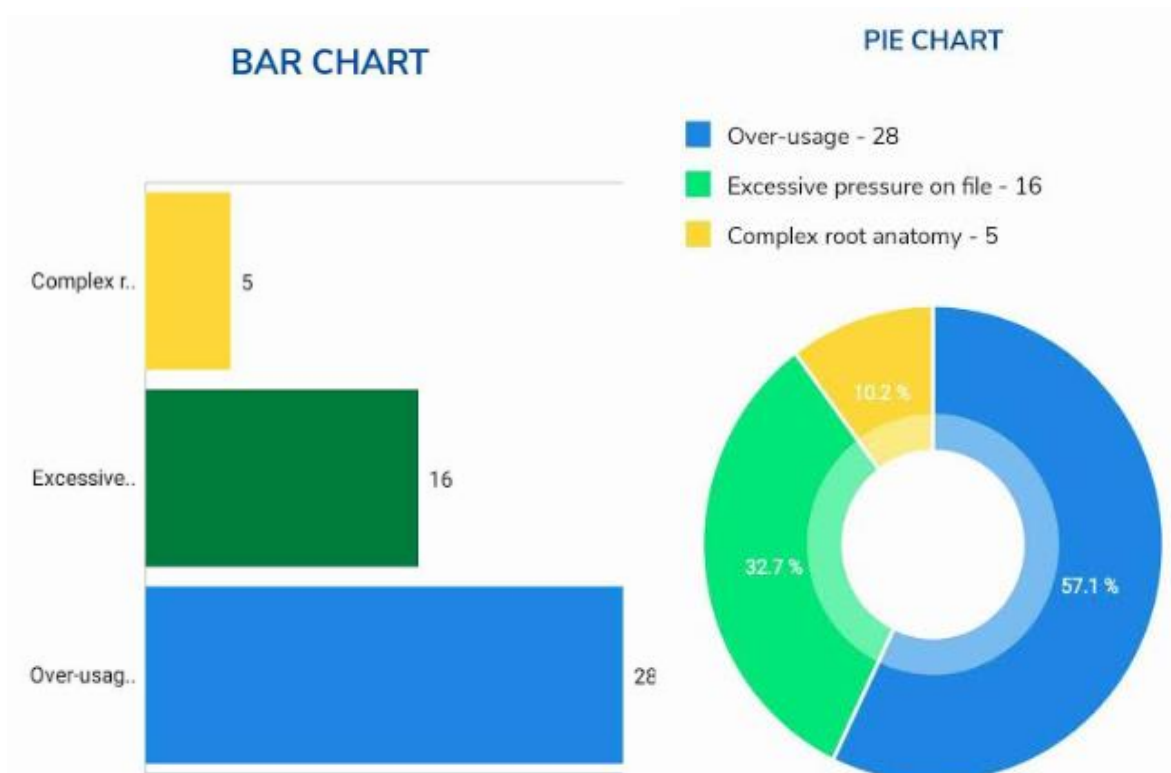
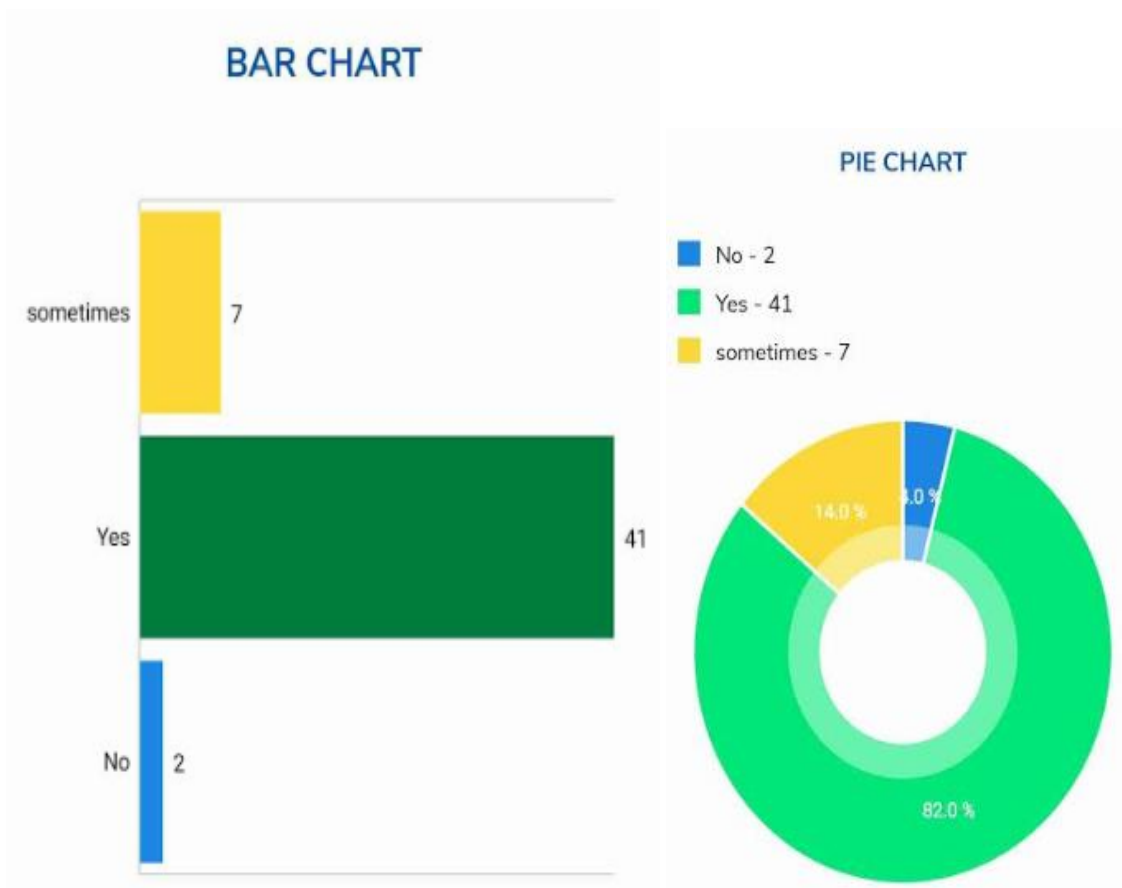
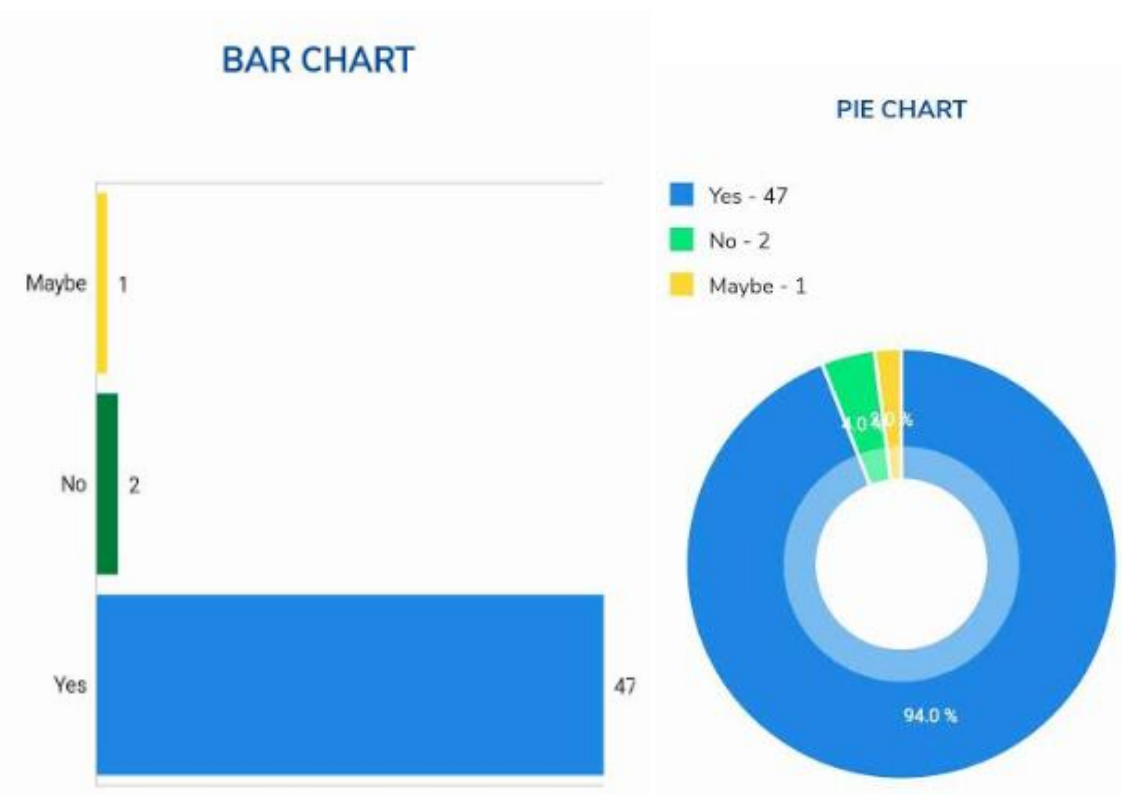


Fig 6: Denotes that the reason of rotary NiTi file fracture was over usage (54.14%) followed by excessive pressure on file (32.65%) and then complex root anatomy (10.20%) and one endodontist skipped the question.



**Fig 7:** Denotes that 82% endodontists believed that canal curvature is maintained by rotary NiTi file, 4% opted for no and 14% believed that curvature is maintained sometimes.



**Fig 8:** Denotes that 94% endodontists believed that canal preparation by rotary NiTi is faster than manual preparation by stainless steel file, 4% said no and 2% said maybe.

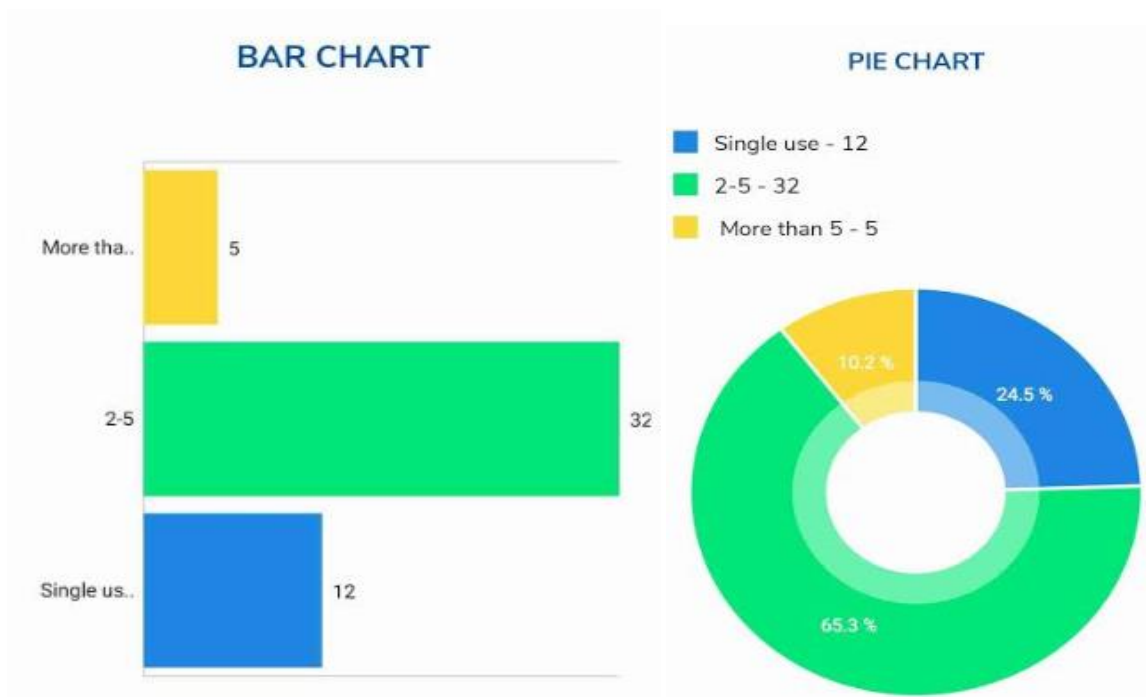


Fig 9: Denotes that 24% endodontists have single use of NiTi rotary files, 65.31% use them 2 to 5 times and 10.20% use more than 5 times.



Fig 10: denotes that 66% endodontists always prefer NiTi rotary instruments over rotary stainless-steel instruments, 2% opted for never and 32% said that sometimes they will prefer NiTi rotary over rotary Stainless Steel instruments.

Table 1:

Questions	Figures
1. How many years of experience after post-graduation?	Figure 1
2. In which teeth you prefer using rotary NiTi instrument	Figure 2
3. Do you prefer rotary NiTi instrument for endodontic retreatment cases?	Figure 3
4. Which procedural error you encounter the most with rotary NiTi instrument?	Figure 4
5. Incidence of file fracture?	Figure 5
6. What according to you is the reason for file fracture?	Figure 6
7. Canal curvatures are maintained by rotary NiTi instrument?	Figure 7
8. Is the canal preparation much faster than the manual instrumentation with stainless-steel instrument?	Figure 8
9. What is your frequency of instrument re-use?	Figure 9
10. Do you prefer rotary NiTi instrument over rotary stainless-steel instrument?	Figure 10



## Discussion

In this study among 50 endodontists 32% of endodontists were undergoing post graduation, 42% have an experience of less than 2 yrs after post graduation and 26% have an experience of three yrs and more (fig 1). This study proved that maximum endodontists in Delhi would prefer rotary NiTi files for endodontic retreatment cases. The questionnaire survey demonstrates that the dentists are well aware of the limitations of the new technology. While dentists have discovered the benefits of rotary NiTi instruments, they acknowledge that there can be procedural problems as well. As indicated in the list of reasons of non use of rotary NiTi instruments the main problem was binding of the instrument within the canal (fig 4).

When the external stresses are placed on a NiTi wire, the austenite form is converted to martensite (stress-induced martensite) form, which can accommodate greater stress without increasing the strain (up to 8%). As a result, a NiTi file has transformational elasticity, also known as superelasticity, or the ability to return to its original shape after being deformed. The stress-induced martensitic state is not stable at room temperature, so an immediate retransformation from the martensitic to the austenite phase occurs once the stress is released. This leads to a spring-back of the endodontic instrument to the original shape when it is removed from the canal [13].

Factors assumed to be responsible for file fracture revealed that dentists mostly inclined to find the mechanisms underlying file fracture. Over usage (54.14%) followed by excessive pressure on file (32.65%) and then complex root anatomy (10.20%) were the most common assumed responsible factors for file fracture by the respondents of our survey (fig 6). NiTi instruments possess a risk of separation or fracture during use because of torsional or cyclic fatigue.<sup>14</sup> In our study, faster canal preparation (94%) (fig 8), and maintaining canal curvature (82%) (fig 7) were the main advantages of using NiTi rotary instruments. In comparison to a study by Parashos and Messer,<sup>13</sup> faster canal preparation (80%), maintaining canal curvature (73%) and easier final canal obturation (72%) were identified as the most important advantages. However, in a study by Barbakow and Lutz,<sup>15</sup> safety (82%), dentists and patients' comfort (76%) and faster canal preparation (54%) were the most reported advantages. In this study 66% endodontists always prefer NiTi rotary instruments over rotary stainless steel instruments, 2% opted for never and 32% said that sometimes they will prefer NiTi rotary over rotary Stainless Steel instruments. 24% endodontists have single use of NiTi rotary files, 65.31% use them 2 to 5 times and 10.20% use more than 5 times. This was due to the experience based opinion that a file can be safely re used more. It seems that experienced operators do not rush through a procedure, so that it could decrease the chance of torsional failure [16, 17]. The questions of survey were such framed that it could educate simultaneously and be knowledgeable to the dentists about the rotary NiTi endodontic instruments. A new emerging branch of dentistry in the near future called "WhatsApp Dentistry" will be coming into picture

## Conclusion

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 which proves that rotary instruments have several advantages over traditional hand filing techniques. The adoption of new endodontic

technologies among endodontists in India has significantly contributed to the enhancement of the quality of endodontic treatment. The present survey provided the qualitative and quantitative information regarding the various aspects of rotary NiTi systems. Questionnaire based studies can serve as a useful tool in successful practice.

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