Original Research Article

KNOWLEDGE, OPINION AND PRACTICE REGARDING INSTRUMENT BREAKAGE OR CANAL PERFORATION DURING ROOT CANAL TREATMENT

ABSTRACT: **Introduction**: Endodontic treatment is a set of operations designed to keep the pulp tissue and periapical area of the tooth healthy. The treatment is done to preserve the normal radicular tissues if the pulp is damaged or wounded. The aim of the study was to examine dentists' knowledge, attitudes, and practises about endodontic disasters and their management. **Materials and methods**: A questionnaire containing close-ended and partially close-ended questions in four categories filled from 202 general dentists, endodontists, and other postgraduates. The participants were quizzed on the frequency of instrument separation and canal perforation, probable etiological causes, instrument retrieval management and strategies, and canal perforation management techniques. Total 20 random participants were asked to fill out the forms twice within a 15-day period to ensure reliability. **Results**: Around 68.8% of participants prefer both Hand and Rotary Instrument Remaining 31.2% depends exclusively on only one system. Around 22.7% of participants are not aware that Instrument breakage and canal perforation can be considered under Consumer Protection Act. Approximately 87.6% of participant performs root canal treatment by them. About 52.5% of participant acknowledged breakage canal H File in the Root system 64.4% of participant consider over usage as a most common cause of File breakage. **Conclusion**: The study participants were informed of the potential etiological causes as well as the management approaches for retrieving the detached instrument and managing canal perforation. The vast majority of them decided to forego the separated instrument.

KEYWORDS: Canal perforation, Dental negligence, Instrument separation, Retrieval techniques, Root canal treatment.

INTRODUCTION:

Dental malpractice is an unintentional act of a dental professional who fails to follow the accepted standards of care, causing harm to the patient.[1] Despite the fact that there have been an increasing number of new procedures and technologies to increase the effectiveness of endodontic treatment in recent years, a growing number of cases of neglect have been documented.[2] Perforation and broken instruments are the most prevalent endodontic malpractices or errors.[3] To limit the number of endodontic treatment-related mishaps, dentists should closely adhere to healthcare standards.[4] Endodontic file fracture has long been thought to be a rare occurrence, however a recent notion of an increased fracture rate with rotatory nickel titanium (NiTi) instruments has emerged.[5] Although root canal instruments can break at any point during treatment, research have shown that smaller instruments are more likely to break.[6] Other research, however, have contradicted this,

finding that larger, stiffer files have the highest rate of fracture.[7,8] The GG burs, carbon steel or stainless steel endodontic files (K files, Hedstrom files, barbed broaches, reamer), NiTi rotary instrument, lateral spreader, pezo reamers, spiral fillers, and irrigation needles have all been observed to fracture within the root canal system.[9-12] The prevalence of endodontic Stainless Steel hand instrument retention has been estimated to be between 0.7 and 7.4%.[13] Surprisingly, 0.9 % of preciously unused NiTi instruments shattered during their first use, possibly as a result of overuse or a manufacture error.[14] Perforation is thought to be responsible for up to 10% of all unsuccessful endodontic cases.[15] Perforation occurs in 2.3 % of all root canal treatment (RCT) teeth, according to a study. More than half of the perforations were found in lower molars, according to the research. Perforation appeared to occur in 2.8 % of roots and 4.2 % of patients, according to the study.[16] In a recent study from Turkey, 1000 endodontically failed teeth were assessed, with 28% of them being excised.[17] The purpose of the study was to examine dentists' knowledge, attitudes, and practises about endodontic disasters and their management.

MATERIALS AND METHODS:

A questionnaire study was conducted among dental health professionals in Pune city to assess knowledge, Opinion and practice regarding instrument breakage or canal perforation during root canal treatment. The objectives of this study were to estimate the knowledge and their conduct towards instrument breakage; and canal perforation and to create awareness about the ethical aspects of the dental procedures. The study duration was about three months. The participants were selected based on the following inclusion criteria: i) Practising dentist, ii) participants who are willing to participate in the study. Non-practicing dentists and interns were excluded from the study. The input parameter for sample size calculation used as follows: 80% power of the study, alpha error 0.05, effect size 0.5, and degree of freedom as 5. The calculated sample size was 192 using G* Power software version 3.1.9.2 (Heinrich Heine University, Düsseldorf). The final considered sample size for the study was around 202. The convenient sampling technique was used in the study. A structured, self-administered, close-ended questionnaire was designed to collect the data which consisted of four parts and comprised of 19 questions related to knowledge, practices and opinions in management instrument separation and canal perforation in RCT. The first part consisted of demographic data such as age, gender, qualification, experience and Dental chair practice and the second, third and fourth part consisted of questions based on knowledge, practice and opinion in management of instrument separation and canal perforation in RCT respectively. The reliability statistics were calculated and Cronbach alpha value was 0.682. The questionnaire was prepared using Google forms (Google LLC, Mountain View, California, United States) and the link was distributed to the selected participants via e-mail, WhatsApp number and other social media platforms (Instagram, Telegram, etc.). A brief introduction about the study was given and informed consent was also taken from all the participants. Data collected were entered in a spreadsheet (Microsoft Excel, 2016). Statistical analysis was done using descriptive statistics. SPSS (Statistical Package for the Social Science) 23.0 version software (IBM Chicago, Illinois, United States) was used. The p-value was set at 0.05.

RESULTS:

In the table 1, there were a total of 202 participants between 18 to 55 years of age. It included 42.6% of graduate dental practitioners, 31.7% endodontists and 23.8% of other post graduates. About 87 participants were male and 116 were female dental practitioner. Out of 202 participants, 60 participants perform single-handed dentistry, 129 participants perform four-handed dentistry and only 13 participants perform six-handed dentistry. In table 2, around 68.8% of participants prefer both hand and rotary instrument remaining 31.2% depends exclusively on only one system. In table 3, 87.6% of participants perform RCT by themselves. Around 82.7% of participant prefers mineral trioxide aggregate (MTA) over other for Management of perforation. About 88.6% of participants believe that with increasing experience steady decrease in canal perforation and Instrument fracture. In table 4, About 53% of participants bypass the broken file if the file fractures at apical third. About 66.3% participants perform apical surgery if file fracture beyond the apex of root 84.6% of the participants are not having Indemnity Insurance for their clinical practice.

DISCUSSION:

The combination of mechanical instrumentation of the root canal system, chemical debridement, and filling with an inert material, known as RCT, is used to preserve or restore the health of the periradicular tissues. There may be many mishaps occurring while performing RCT which may include Root canal perforation and instrument separation. The study mainly focus on the knowledge of the dentist regarding the Root canal perforation and instrument separation and what are the measures to be taken to reduce those mishaps. In our study 39.6% of the respondents said that they prefer Hybrid technique over any other technique for BMP. Similar result was given by El-Kishawi M et. al. study which concludes that hybrid technique is commonly used approach that combines the benefit of both the crown down and Step back technique and reported to be one of the best techniques to produce optimal root canal preparation outcome.[18] About 64.4% of the respondents said that over usage of the instrument can be the most probable cause for Instrument Separation. A review by Ramugade MM et. al. which stated that during canal shaping procedure due to unusual canal anatomy, severe curvature, calcifications, improper working length determination, forceful instrumentation and overzealous use of instrument, breakage of hand or rotary endodontic file is common[19]. About 82.7% of the respondents had chosen MTA as the material of choice for Root Canal Perforation repair. This can be supported by study done by Savitha A et. al. Suggested that a material with excellent sealing property MTA was introduced by Torabinejad et. al.[20], who later described clinical procedures for application of MTA in capping of pulp with reversible Pulpitis, apexification, repair of root perforations surgically & none surgically as well as its use as root filling material. 88.6% of the respondents said that file breakage and canal perforation have reduced with increasing experience. A similar result was found in study by Ba-Hattab R et. al. which says that 54.5% of respondents had experienced instrument separation during RCT and there was statistically significant correlation seen between professional qualification & fracture occurance.[21] Around

77.2% respondents were aware that instrument seperation and canal perforation can be considered as act of negligence under Consumer Protection Act. A review by Ramugade MM et. al. which stated that instrument separation in root canal or beyond the apex during treatment would be considered as the procedural error or mishap in the literature, however hiding the present mishap situation from the patient amounts to negligence[19]. 36.1% of the respondents said that they do not take indemnity insurance. A study by Bhanushali V et.al. stated that it was seen that knowledge & awareness among senior practioners were higher and so were perceived needs. More than 50%. of Study population was not aware of dental indemnity insurance and didn't know procedure to apply for it. 20% dentists felt that it was not mandatory for each and every dentist where as 9.5% dentist felt that there was no need for indemnity insurance.[22]

RECOMMENDATIONS:

1. There should be a strict policy implementation against dental negligence.
2. There should be an agency that will ensure that most of the dental practitioners should have dental indemnity insurance.

CONCLUSION:

The study concluded that the overall knowledge, attitude and their conduct for the management of mishaps during RCT of study participants was average, hence more comprehensive program should be implemented among dental practitioners.

COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors

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TABLES:

Table 1: Demographic Details of Study Participants (N=202).

Sr. No.	Demographic details	Responses	Number (N)	Percentage (%)	Total N (%)
1	Age	25-35	133	65.6	202
		36-45	51	25.4	
		46-55	18	9	
2	Gender	Male	86	42.6	202 (100)
		Female	116	57.4	
3	Qualification	BDS	90	44.6	202 (100)
		MDS	48	23.8	
		ENDODONTIST	64	31.7	
4	Experience	1-10	121	59.8	202 (100)
		11-20	59	29.1	
		21-30	18	9.1	

		Above 31	4	2	
5	Dental Chair Practice	Single Handed Dentistry	60	29.7	202 (100)
		4 Handed Dentistry	129	63.9	
		6 Handed Dentistry	13	6.4	

Table 2: Knowledge Based Question's responses of study participants (N=202).

Sr. No.	Questions	Responses	Number (N)	Percentage (%)	Total
1	Which type of endodontic instrument do you prefer	Hand instrument	33	16.3	202 (100)
		Rotary instrument	30	14.9	
		Both	139	68.8	
		Others (specify)	0	0	
2	Which technique do you use most commonly for biomechanical preparation during Root Canal Treatment	Crown Down Technique	67	33.2	202 (100)
		Step Back Technique	55	27.2	
		Hybrid Technique	80	39.6	
		Others (Specify)	0	0	

3	Are you aware that instrument breakage and canal perforation can be consider under dental negligence under consumer protection act	Yes	156	77.2	202 (100)
		No	15	7.4	
		Don't Know	31	15.3	

Table 3: Practice Based Question's responses of study participants (N=202).

Sr. No.	Questions	Responses	Number (N)	Percentage (%)	Total
1	How do you perform a root canal treatment in your dental setting	Yourself	176	87.6	202(100)
		By consultation	16	8	
		Refer to endodontist	9	4.5	
		Others	0	0	
2	Which Instrument usually fracture in your clinical	Hand Instruments	82	40.6	202 (100)
		Rotary Instruments	113	55.9	

	practice	Long shank Burs	7	3.5	
		Others (specify)	0	0	
3	Which type of Hand file do you fracture the most	K File	55	27.2	202 (100)
		H File	106	52.5	
		Barbed Broaches	41	20.3	
		Others (specify)	0	0	
4	What are the most probable reasons for instrument fracture	Excessive Pressure on file	42	20.8	202 (100)
		Infrequent Irrigation	30	14.9	
		Over usage	130	64.4	
		Others (Specify)	0	0	
5	What is your conduct after Instrument breakage occurs at a dental setting	Inform and try to treat yourself	83	41.1	
		Inform and call a specialist and treat the patient	75	37.1	
		Don't inform and continue the treatment	44	21.8	
		Any other	0	0	
6	What is your conduct after tooth perforation occur at a dental setting	Inform and try to treat yourself	91	45	202 (100)
		Inform and call a specialist and treat the patient	66	32.7	
		Don't inform and continue the treatment	45	22.3	
		Any other	0	0	
7	How do you manage separated instrument	Retrieve the instrument	90	44.6	202 (100)
		Bypass the separated instrument	94	46.5	
		Obturate over the separated instrument	18	8.9	
		Others	0	0	
8	How do you manage canal perforation	MTA	167	82.7	202 (100)
		calcium hydroxide	32	15.8	
		zinc oxide eugenol	3	1.5	
		Other (specify)	0	0	
9	Do you believe that the	Yes	179	88.6	202 (100)

	breakage of the file and canal perforation has decreased with your increasing experience	No	11	5.4	
		Don’t Know	12	5.9	

Table 4: Opinion Based Question`s responses of study participants (N=202).

1	Do you inform your patient regarding all possible consequences of root canal treatment	Always	42	20.8	202 (100)
		Rarely	37	18.3	
		Sometimes	116	57.4	
		Never	7	3.5	
2	Do you believe in 'single file system for a single patient'	Yes	79	39.1	202 (100)
		No	79	39.1	
		Don't Know	44	21.8	
3	What is your treatment plan if file fractures AT the apical third	Bypass the broken instrument	107	53	202 (100)
		Retrieve the instrument	67	33.2	
		Leave the instrument	28	13.9	
4	What is your treatment plan if file fractures beyond the apex	Apical surgery	134	66.3	202 (100)
		Retrieve the instrument	33	16.3	
		Leave the instrument as it is	30	14.9	
		others	3	2.5	
5	Do you encounter 'perforation of tooth structure during file retrieval'	Always	16	7.9	202 (100)
		Sometimes	129	63.9	
		Rarely	49	24.3	
		Never	8	4	
6	Do you take Indemnity Insurance for your dental practice	Yes	31	15.3	202 (100)
		No	73	36.1	
		Never consider	55	27.2	
		Don't know about it	43	21.3	