

## Opinions and Attitudes of Dental Practitioners towards Intracanal Separation of Endodontic Instruments

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### ABSTRACT

**Objective:** To investigate the opinions and attitudes of dental practitioners towards intracanal separation of endodontic instruments and to create awareness regarding the management of separated instruments

**Study Design:** Cross-sectional survey

**Place and Duration of Study:** Department of Operative Dentistry Armed Forces Institute of Dentistry, Rawalpindi Pakistan, from Mar to Apr 2021.

**Methodology:** An online questionnaire was circulated among 374 dentists of private and public hospitals in Rawalpindi and Islamabad. The questionnaire consisted of close-ended questions related to demographic details, dentists' awareness of instrument separation, the frequency of separated instruments, the causes of separation, the management of separated instruments, and the retrieval strategies if used.

**Results:** Out of 374 study participants, 307(82.1%) of the participants thought that operator-related factors such as improper or overuse of the instrument were considered the most common factors for instrument separation during root canal procedures. 205(54.8%) thought unwinding, defective flutes and shiny areas were the most common factors affecting instrument separation. 241(64.4%) of the instruments are separated during cleaning and shaping. 135(36.1%) K files and 119(31.8%) H files were separated in this survey.

**Conclusion:** Most dentists of Rawalpindi and Islamabad face the problem of endodontic instrument separation during root canal preparation.

**Keywords:** Endodontic instruments, Dentists, Dental instruments, Root canal preparation, Endodontics, Root canal therapy.

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### INTRODUCTION

Among the many aetiologies of dental diseases, endodontic causes are the most frequent reasons for pain, which can be relieved by mechanical and chemical debridement of the root canal.<sup>1,2</sup> The primary goal is to prevent re-infection and promote healing of the periapical tissues by eliminating the microbes of the root canal space.<sup>3</sup> The effectiveness of treatment depends upon how carefully the steps of root canal cleaning have been followed; however, the mechanical methods of root canal cleaning are associated with various iatrogenic errors like instrument separation, ledge formation, zipping and transportation.<sup>4</sup> The Endodontic mishaps, including instrument separation, can be reduced by adopting prevention strategies. However, the clinical skills and expertise of the dentist do not ensure the absolute elimination of such endodontic mishaps during root canal preparation.<sup>5,6</sup>

Instrument separation is the most common incident among the various iatrogenic errors occurring during root canal procedures. Separated instruments prevent optimal preparation and obturation of the root canal system, negatively affecting the long-term prognosis.<sup>7</sup> Separated instruments can be retrieved, bypassed or sealed within the root canal. The separated segment can be retrieved using handfiles, ultrasonics or Masserann Kit.<sup>8</sup> Operator skill, limiting file re-use and a better understanding of the root canal morphology can prevent the incidence of endodontic instrument separation.<sup>9,10</sup>

Only a few studies are available regarding the opinions and attitudes of dental practitioners towards intracanal instrument separation, which has yet to be carried out in Pakistan. This survey was designed to investigate the opinions and attitudes of dental practitioners towards intracanal separation of endodontic instruments and to create a self-assessment of their knowledge regarding the management of separated instruments. This study will help in inducing awareness among dentists about the alarming persistence of instrument separation risk

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despite having sufficient knowledge about the etiological factors and preventive measures to avoid such mishaps. It will also highlight the factors that repeatedly cause instrument separation among general dentists and specialists.

### METHODOLOGY

The cross-sectional survey was conducted from March to April 2021. The ethical approval was obtained from the Ethical Committee of the Armed Forces Institute of Dentistry Pakistan (918/Trg/26th February 2021).

**Inclusion Criteria:** Dentists practicing at the private and public hospitals of Rawalpindi and Islamabad, Pakistan were included.

**Exclusion Criteria:** None

The survey ensured confidentiality and was voluntary. A 09-item questionnaire was developed and pretested to ten dentists, including general dentists and endodontists. Difficulties regarding the comprehension of the questionnaire were identified and addressed according to the results of this pilot study. This questionnaire was finalised using AME Guideline Number-87,11 and this questionnaire consisted of close-ended questions related to demographic details, questions regarding the awareness of dentists regarding the separation of instruments, frequency of separated instruments, causes of separation, management of separated instruments, and retrieval strategies if used.

After obtaining permission from the Ethical Committee an online questionnaire was distributed to the participants via Google Forms. All non-practicing dentists were excluded from the study. Statistical Package for Social Sciences (SPSS) version 24.0 was used for the data analysis. Quantitative variables were expressed as Mean $\pm$ SD and qualitative variables were expressed as frequency and percentages.

### RESULTS

The questionnaire was distributed among 384 dentists, out of which 374 responded, which makes a response rate of 94%. The mean age of the participants was 28.82  $\pm$  6.35. Most respondents were female 287(76.7%), and the rest were male (87/374; 23.3%). Most of the dentists that participated were FCPS residents (286/374; 76.5%) and had experience of 1-5 years (336/374; 89.8%). Of the 374 participants, 352 worked in a tertiary care setting (94.1%). These demographics are presented in Table-I.

**Table-I: Baseline Demographics of the Participants (n=374)**

Parameters		n(%)
Age (Mean $\pm$ SD)		28.82 $\pm$ 6.35
Gender	Female	287(76.7%)
	Male	87(23.3%)
Qualification	Consultant	29(7.8%)
	FCPS resident	286(76.5%)
	General dentist	59(15.8%)
Years of Practice	1 to 5 years	336(89.8%)
	10 years or more	16(4.3%)
	5 to 10 years	22(5.9%)
Place	Private clinic	15(4.0%)
	Single dental unit hospital	07(1.9%)
	Tertiary care hospital	352(94.1%)

Common causes of instrument separation were categorised into four groups. Respondents were asked to select the most common cause from all the four options. 82.1%(307/374) thought that operator-related factors such as improper or overuse of the instrument were considered the most common factors for instrument separation during root canal procedure, and 76.5%(286/374) instruments were separated due to overuse and not discarding faulty files. 54.8%(205/374) thought unwinding, defective flutes and shiny areas were the most common factors affecting instrument separation. 64.4%(241/374) of the instruments were separated during cleaning and shaping. 36.1%(135/374) K files and 31.8%(119/374) H files were separated in this survey. Among the 274 respondents who experienced instrument separation, 218(58.3%) indicated using a braided technique to retrieve the separated instrument. Detailed results are mentioned in Table-II.

### DISCUSSION

Much advancement has occurred in endodontic instrument design and instrumentation techniques, but instrument separation during root canal procedure is still the leading problem among iatrogenic errors.<sup>11</sup> A wide range of instruments have been reported being separated during the root canal preparation, including GG burs, peeso reamers, stainless steel endodontic files, NiTi rotary instruments and lateral spreaders. Many studies have been conducted to assess the frequency and causes of instrument separation.<sup>12,13</sup> A previous study showed that instrument separation frequency was 54.5%, and a similar study was done in Athens. However, only a few surveys have been conducted to evaluate dentists' opinions and attitudes towards instrument separation.<sup>14</sup> Our survey was designed to investigate the opinions and attitudes of

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**Table-II: Opinion and Practice regarding Instrument Separation (n=374)**

Questions	n (%)	
Common Causes Of Instrument Separation	Complicated root canal anatomy	14(3.7%)
	Improper / overuse of the instrument	307(82.1%)
	Inadequate/improper access cavity	40(10.7%)
	Limitation in physical properties / manufacturing defects of instruments	13(3.5%)
Factors that affect Instrument Separation	Bended / crimped instrument	118(31.6%)
	Corrosion of the instrument	28(7.5%)
	Shiny areas / unwinding / Defected flutes	205(54.8%)
	When used in a troublesome canal	23(6.1%)
Importance of Taking Radiographs	Give information / possibility about retrieval / bypassing	182(48.7%)
	It would confirm separation	15(4.0%)
	It would give information about size of the separated segment	4(1.1%)
	It would give information about the location of the instrument	173(46.3%)
Which Stage instrument Separated Most frequently?	During cleaning and shaping	241(64.4%)
	During placement of intracanal medication	04(1.1%)
	GP retrieval during retreatment	13(3.5%)
	While negotiating the canal	116(31.0%)
Which Instrument got Separated Most Frequently?	GG / Peeso drill / Lentulospiral	10(2.7%)
	H files	119(31.8%)
	K files	135(36.1%)
	Rotary files	110(29.4%)
In your practice what is the most common cause of Separation?	Improper use of Instrument / not following recommended sequence	22(5.9%)
	Instruments are not of good quality / manufacturing defects of instruments	31(8.3%)
	Not preparing adequate access cavity / Complex anatomy	35(9.4%)
	Over use of instruments / not discarding faulty instruments	286(76.5%)
What action do you take when there is possibility of retrieval?	Do not inform the patient and continue the treatment (Try to retrieve the instrument)	74(19.8%)
	Do not inform the patient and refer to another professional	04(1.1%)
	Inform the patient and continue the treatment (Try to retrieve the instrument)	261(69.8%)
	Inform the patient and refer to another professional	35(9.4%)
What action do you take when there is no possibility of retrieval?	Do not inform the patient and continue the treatment (Try to bypass the instrument)	24(6.4%)
	Do not inform the patient, leave the separated instrument and complete rest of treatment	24(6.4%)
	Inform the patient and continue the treatment (Try to bypass the instrument)	167(44.7%)
	Inform the patient, leave the separated instrument and complete rest of treatment	159(42.5%)
Technique of Retrieval	Braided technique	218(58.3%)
	Masserann kit	04(1.1%)
	Rotary system	54(14.4%)
	Ultrasonic	98(26.2%)

dental practitioners towards intracanal separation of endodontic instruments and to create a self-assessment of their knowledge regarding the management of separated instruments. Our survey categorised common causes of instrument separation into four groups. Respondents were asked to select the most common cause from all the four options. There was an overall agreement among the consultants, FCPS

residents, and GDPs. Operator-related factors such as improper or overuse of the instrument were considered the most common factors for instrument separation during root canal procedures (82.1%). Problems in access cavity design (i.e. improper or inadequate access cavity) were considered the second most common cause of instrument separation (10.69%), followed by complicated root canal anatomy (3.74%).

However, factors related to the manufacturers (i.e. limitation in properties or manufacturing defects) were considered the least important (3.47%). A previous study concluded that there is a higher risk of instrument separation among inexperienced operators with limited clinical skills.<sup>15</sup>

Respondents were asked about their approach once the instrument was separated. 261(69.8%) respondents reported that they informed the patient about the separated instrument and tried to retrieve it when possible. Only four respondents (1.1%) reported not informing the patient about the separated instrument and referring the patient to another professional. However, a relatively lesser number of respondents (44.7%) attempt to bypass the separated instrument when retrieval is impossible. If the instrument is separated during the treatment, the dentist is legally obliged to notify the patient and record it in the patient's file. Similarly, in one previous study, only about half of the participants (53.2%) said they would inform patients of the separated instrument if there were any possibility of instrument retrieval. This indicates considerable reluctance among dental practitioners to inform patients about the incident.<sup>16</sup>

Participants were asked about the stage of root canal preparation at which the instrument is most commonly separated. Answers were categorised into four closed-ended responses. Most respondents indicated that endodontic instruments were usually separated during the cleaning and shaping of the root canal (64.4%). The second most common stage of instrument separation, as indicated by the respondents, was while negotiating the canal (31%). However, only 3.5% and 1.1% of respondents reported instrument separation during GP retrieval and placement of intracanal medication, respectively. However, a study by Tzanetakis *et al.* reported the highest frequency of instrument separation in retreatment cases.<sup>17</sup>

Among the 274 respondents who experienced instrument separation, 218(58.3%) indicated using a braided technique to retrieve the separated instrument. The proportion of FCPS residents using this technique was significantly higher than the consultants and the GDPs. The use of ultrasonics for instrument retrieval was found to be the second most common practice among the respondents. A significantly higher proportion of FCPS residents used this technique, followed by GDPs and consultants. The rotary system

and Masserann kit were the least commonly used techniques. However, a previous study reported the use of ultrasonics as the most frequent technique (84.6%) for instrument retrieval among endodontists and general practitioners followed by the use of Masserann kit.<sup>18</sup>

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#### CONCLUSION

Most GDPs and specialists in Rawalpindi and Islamabad face the problem of endodontic instrument separation during root canal preparation. The K file is mostly separated, and the braided technique is commonly used for retrieval.

**Conflict of Interest:** None.

#### Authors Contribution

Following authors have made substantial contributions to the manuscript as under:

SMFG & KI: Conception, study design, drafting the manuscript, approval of the final version to be published.

SFTZ & AY: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

FM & DR: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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