

Knowledge, attitude, and practice of ultrasonics in endodontic treatment: A Survey among general practitioners and endodontists

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ABSTRACT

The use of ultrasonics (US) has greatly expanded in the field of dentistry. Over the past few decades, the application of US has increased substantially in endodontics owing to the predictable prognosis and ease of operation. The objective of this survey was to determine the knowledge, practice, and attitude of US in endodontics among the general practitioners, postgraduates, and endodontists. An electronic questionnaire containing 16 questions regarding the knowledge, attitude, and practice of US in endodontics was circulated among the general dentists, postgraduates, and endodontists and the responses were collected online. Data were statistically examined using IBM SPSS software. A total of 202 dentists (general dentists = 92, endodontists = 77, and postgraduates = 33) participated in the survey. Eighty-nine percent of them were aware of the use of US in endodontics, 36.1% of them preferred using US in the removal of pulp chamber calcifications, pulp stones, access refinement, and troughing hidden canals, and 61.4% chose <3% sodium hypochlorite for root canal irrigation with US. The cost of the ultrasonic unit and heat generation during procedures were considered the greatest limitation in using the US. The majority of the dentists were well aware of the use of US and its advantages in various endodontic procedures but they did not use it routinely in their practice. The use of US has been reported to have greatly increased the predictability of endodontic treatment.

Key words: Calcification, endodontics, instrument retrieval, irrigation, piezoelectric, ultrasonics

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INTRODUCTION

Endodontic practice has seen a massive technological leap over the past few decades which has improved the prognosis of the treatment performed.^[1] The mechanical energy is transferred in ultrasonic frequency to the cutting tips to produce microvibrations.^[1,2] Commonly, 20–45 Hz frequency is used while low-frequency ultrasonics (US) are being developed recently.^[3,4]

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In dentistry, US were first introduced for cavity preparation using abrasive slurry but it could not compete with the high-speed handpieces.^[5] Martin and Cunningham coined the term “Endosonics” for the use of US for root canal preparation and disinfection.^[6,7] US are used for various procedures in endodontics such as refinement of access and troughing canals that are occluded by calcification and prevention of perforation and gives a better view of access, removing calcification, removal of separated instruments and posts, biomechanical preparation of root canal, intracanal activation of irrigants causing destruction of the bacteria, for retrograde root preparation and filling during surgery.^[8-15] This knowledge, attitude, and practice (KAP) survey aims to determine the KAP of US in endodontics among general practitioners, postgraduates, and endodontists.

MATERIALS AND METHODS

This study which is a cross-sectional survey was conducted from November 2020 to January 2021. Approval for this study was obtained from the Saveetha Institute of Medical and Technical Sciences, Institutional Review Board (IHEC/SDC/ENDO/21/195).

A questionnaire consisting of 23 questions was formulated. The questionnaire was shared in online mode through Google Forms and responses were obtained from participants. The sample size was calculated using G power (RRID:SCR_013726) with a confidence interval of 90%. A total of 230 questionnaires were shared with general practitioners, postgraduate students, and endodontists who performed root canal treatment and other endodontic procedures. Out of which, 28 did not take up the survey. Therefore, a total number of participants were 202. Data for 23 questions were compiled and exported to IBM SPSS v. 20.

Statistical analysis

Data were analyzed in IBM SPSS v. 20. Descriptive statistics were performed for the collected data. Significant differences in the frequencies and percentages of the variables were determined using the Chi-square tests.

RESULTS

A total of 230 electronic questionnaires were circulated through various social networking platforms, among which 202 (general dentists = 92, endodontists = 77, and postgraduates = 33) participants responded. Demographic data of the participant are shown in Table 1. 89.1% of the participants were aware of the use of US in endodontics. For knowledge-based questions regarding the preferred type of US in endodontics, working principle, and working frequency, 78.2% chose piezoelectric, 82.2% chose both cavitation and acoustic streaming, and 44.1% chose 25–30 kHz frequency, respectively. Fifty percent of the participants agreed and 41.6% strongly agreed that

Table 1: Demographic data

| Demographic variables | Categories | Number of respondents, n (%) |
|------------------------------|-----------------------|------------------------------|
| Gender | Female | 130 (64.4) |
| | Male | 72 (35.6) |
| Age (years) | 23-30 | 139 (68.8) |
| | 31-40 | 35 (11.6) |
| | 41-50 | 22 (7.3) |
| | Above 50 | 6 (2) |
| Specialty | General practitioners | 92 (30.4) |
| | Postgraduates | 33 (10.9) |
| | Endodontists | 77 (25.4) |
| Years of clinical experience | <5 | 114 (56.4) |
| | 5-10 | 49 (24.3) |
| | 10-20 | 23 (11.4) |
| | Above 20 | 16 (7.9) |
| Type of clinical practice | Private | 115 (56.9) |
| | Cooperate | 14 (6.9) |
| | Academic institute | 66 (32.7) |
| | Social welfare | 7 (3.5) |

ultrasonic activation of irrigants reduces the bacterial biofilm compared to conventional irrigation. 52.5% of the participants felt that US were moderately effective in retrieval of the broken instruments [Figure 1]. 61.4% of the participants opted for 3% or less sodium hypochlorite as an irrigant and 60.9% of them opted to activate irrigants for <1 min [Figure 2]. The majority of the participants used US for removal of pulp chamber calcification/pulp stones (36.1%) and root canal irrigation (30.6%). Heat generation and cost of the ultrasonic unit were a major concern for 34.2% and 64.4% of the participants, respectively [Table 2]. 77.2% of the dentists did not use ultrasonic. There was no significant difference between the general practitioners, postgraduates, and endodontists in the KAP of US in endodontics ($P > 0.05$).

DISCUSSION

For the past few years, endodontics has been greatly benefited by the use of US. In the present survey, we found that the majority of the participants including general practitioners, postgraduates, and endodontists were well aware of the use of US in endodontics and had adequate knowledge regarding the working principle and the type of endosonics used. The majority of the participants opted for 25–30 kHz as the working frequency of US in dentistry. While most ultrasonic units use a frequency between 25 and 42 kHz.^[16] 36.1% of the participants preferred to use the US in access cavity refinement, removal of calcifications, pulp stones, or troughing for canals. Obstructions are frequent in the root canal system; the US helps to remove them by direct or indirect contact.^[17-20]

30.6% of the participants opted to use the US for root canal irrigation. Forty-one percent of the participants strongly

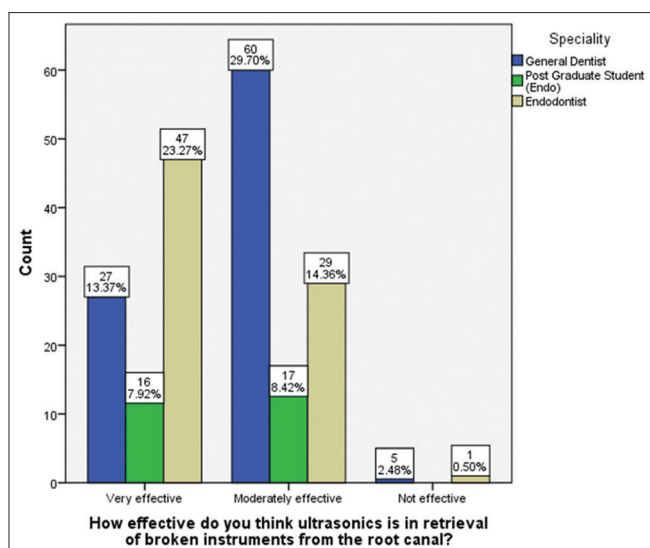


Figure 1: Efficacy of US in broken instrument retrieval in endodontics. US: Ultrasonics

Table 2: Limitation in using endosonics

| Limitation | Yes (%) | No (%) | Maybe (%) |
|------------|---------|--------|-----------|
| Heat | 34.2 | 22.3 | 43.6 |
| Cost | 64.4 | 35.6 | - |
| Time | 41.1 | 58.9 | - |

agreed that US irrigation reduces the bacterial biofilm compared to conventional methods. Recent studies have shown that the US is effective in debris and smear layer removal along with reducing the bacterial biofilm.^[21] 60.9% of the dentists preferred to activate the irrigants in the root canal for <1 min. General practitioners, postgraduates, and endodontists picked 3% or lesser concentration of sodium hypochlorite to be used as an irrigant for US activation followed by sodium chloride and more than 3% sodium hypochlorite. Cameron in his study reported the complete removal of the smear layer with the US.^[22,23]

52.6% of the responders felt that the US was moderately effective in the retrieval of the broken instruments.^[24-26] Regarding the questions on disadvantages of using US, 64.4% felt the cost of the US unit and tips to be the major drawback followed by the heat generated by the US while in use. Studies have reported that the use of US, especially without coolant for the removal of fractured instruments increases the temperature significantly.^[27,28] Recent US tips with water flow have proved to be a better alternative to regulate the temperature during the use of the US.^[29]

The present study reveals that dental practitioners were well aware of the use of endosonics. It also shows that there is no statistically significant difference ($P > 0.05$) between the general practitioners, endodontists, and postgraduates regarding the KAP of using endosonics. Most of the general practitioners and especially endodontists noticed positive

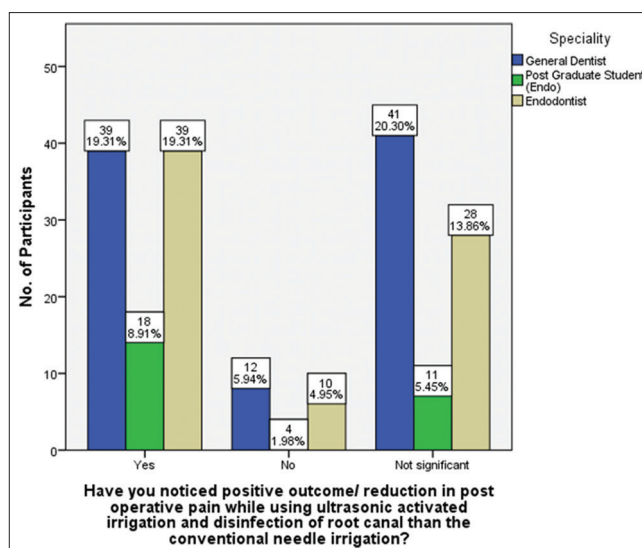


Figure 2: Efficiency of US in root canal irrigation and disinfection. US: Ultrasonics

outcomes with the use of US in root canal treatment but the majority of them did not use it routinely in their practice. The cost of the ultrasonic unit and heat generation was considered a major limitation in usage of US.

Our research and knowledge have resulted in high-quality publications from our team.^[29-42] The limitation of the study is that the sample size was small. Furthermore, high-quality clinical trials are necessary to determine the efficacy of the latest ultrasonic units in endodontics.

CONCLUSION

Eighty-nine percent of the dentists were well aware of the use of US and its advantages in various endodontic procedures such as removal of root canal obstructions, irrigation, broken instrument retrieval, and endodontic surgeries but they did not use it routinely in their practice. This would be due to the cost of the ultrasonic unit and heat generation. The use of US has been reported to have greatly increased the predictability of endodontic treatment. It is also an important tool in the current concept of minimally invasive dentistry.

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Conflicts of interest

There are no conflicts of interest.

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