

## Survey on Materials, Methods And Difficulties in Obturating the Root Canal System Among Bulgarian Dental Practitioners

\*E. Boyadzhieva<sup>1</sup>, S. Dimitrova<sup>1</sup>, I. Filipov<sup>1</sup>, N. Musurlieva<sup>2</sup>

<sup>1</sup>Department of operative dentistry and endodontics, Faculty of dental medicine, Medical University-Plovdiv, Bulgaria

<sup>2</sup>Department of social medicine and public health, Faculty of public health, Medical University-Plovdiv, Bulgaria

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**Abstract:** Complex anatomy of the root canal system creates difficulties in its cleaning, shaping and 3D obturation, which is a prerequisite for a number of failures of the endodontic treatment. This survey is aimed at identifying the methods and tools used for obturation of the root canal system, as well as the problems associated with their application in dental practice. An anonymous survey was conducted among 157 dental practitioners of different ages, length of service and practice location. The questionnaire includes 15 questions, the respondents are expressing their opinion on the frequency of endodontic treatment, the difficulties, methods and means of obturation of the root canal system. 30% of the respondents conduct endodontic treatment every day. More than half of the respondents indicated the complex root canal anatomy as the greatest difficulty in processing and filling the root canal system, single-cone technique is referred to by more than 60% as the most commonly used root canal obturation method, and zinc-oxide eugenol and formalin-resorcin sealers are still reported by the largest percentage of respondents. 80% of the respondents indicated that they needed additional information on the root canal system obturation. Despite the evolution in the techniques of shaping, irrigation and obturating, the majority of practitioners have used established in time methods and means of obturating the root canal system.

**Keywords:** obturation, root canal system, survey

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### I. Introduction

Functional, esthetic and psychological advantages of saving natural teeth have increased the importance of root canal treatment. It has been showed that more than 50% of teeth do not receive well qualified root canal treatment and 20-30% of them end up with some radiographic signs of apical periodontitis [1]. Hermetic seal of the root canal system during root canal treatment is in paramount matter for the long-term prognosis of the treated tooth [2]. Various means and methods exist for providing 3D obturation of the root canal system, which makes the choice of the proper ones much more difficult. The complex root canal anatomy is an obstacle for general practitioners when cleaning and shaping.

#### 1.1. Objective of the study

As the attitudes and approaches of general practitioners toward endodontic therapy reflect the quality of root canal treatment and little information is available on changes in root canal obturation techniques, the aim of this study was to establish the difficulties, methods and materials utilized when obturating root canal system in dental practices.

### II. Materials And Methods

This anonymous survey was approved by Department of Operative Dentistry and Endodontics in Medical University-Plovdiv and distributed among 157 general dental practitioners during a national scientific congress. The questionnaire comprised of 15 questions with multiple-choice answers with an option for "other". Space was provided below for additional comments in case any treatment modifications were not covered by the given choices. The questionnaire included demographic information and questions about the difficulties, materials and methods that are typically used in endodontic therapy and obturation of the root canal system. The participants were selected through random sampling technique and the respondents were assured with their anonymity and confidentiality of the responses. Gathered information was verified, coded and introduced to an Excel data basis for further statistical grouping, regrouping and analysis. For this purpose, the following analytical statistical methods were utilized:

1. Analysis of the frequency distributions for description of quantitative variables with normal distributions. Kolmogorov-Smirnov test was utilized for verification of normality of distribution. Independent sample t-test (Student t-criteria) was used for statistically significant difference in quantitative indexes with normal distribution.

2. Alternative analysis for evaluation of frequency distributions in qualitative and grouped data.
3. Unparametrical analysis for presence of relations and interrelations between the studied signs and phenomena using  $\chi^2$ . When testing hypotheses for a minor influence of a given factor, Fisher's exact test was used in quadruplicate tables and the  $\chi^2$  criterion in multiple tables.
4. Graphical analysis - EXCEL 2007 was used to visualize the results. Software products were also used for statistical data processing using SPSSv17.

### III. Results And Discussion

From 170 interviewed genral dental practitioners, 157 correctly filled surveys were collected and statistically processed. Thirteen of them dropped out of the study due to incorrect replenishment.

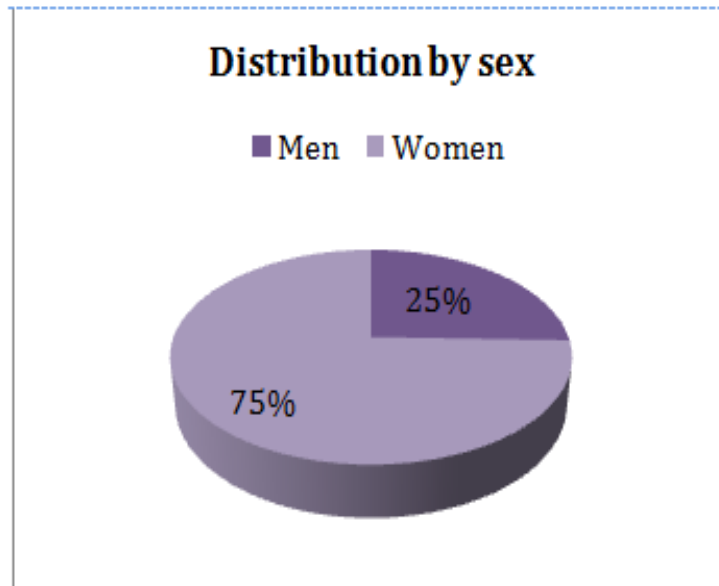


Figure 5. Distribution by sex

The distribution by sex and the distribution by work experience of the dentists surveyed are presented in figures 5 and 6.

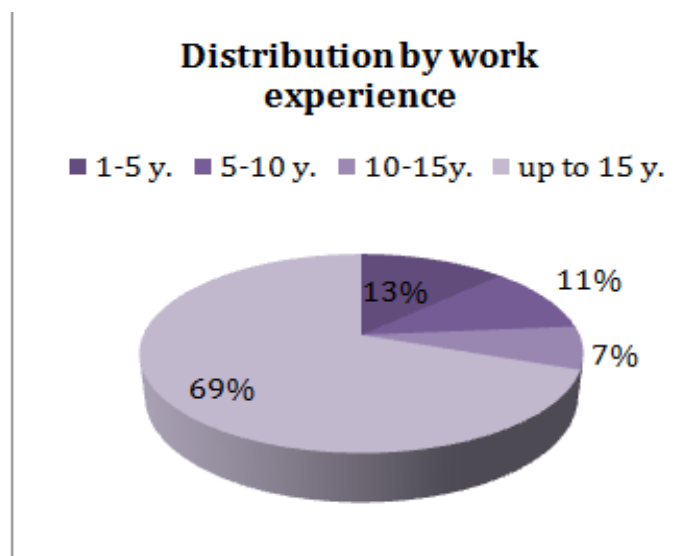


Figure 6. Distribution by work experience

43% of the respondents undergo endodontic treatment each day and 67% identify primary endodontic treatment as their prevalent practice (Figure 7)

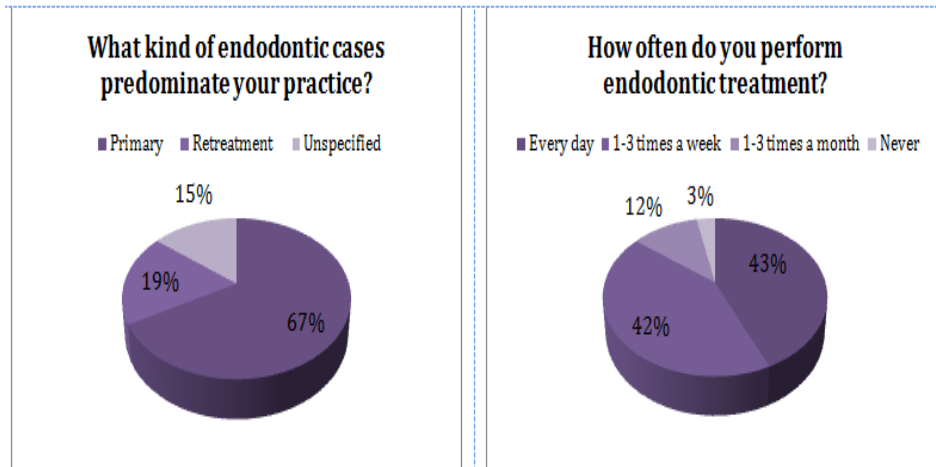


Figure 7. Frequency of endodontic treatment

More than half of the respondents (83%) reported complex root-canal anatomy as the greatest difficulty in both processing and 50% in obturating the root canal system.(Figure 8)

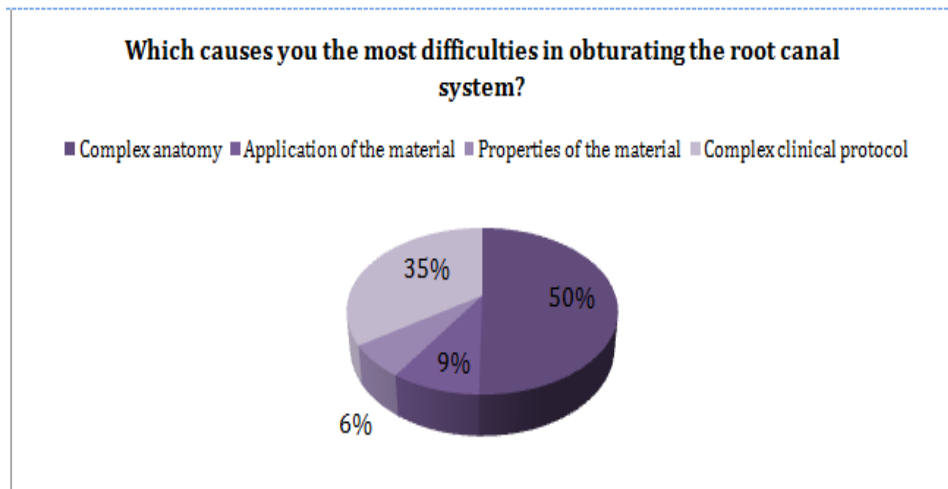


Figure 8. Root canal obturation difficulties

39% of respondents use a combination of manual and machine endodontic file systems to shape the root canal system, 23% - machine only, 18% only manual. (Figure 9)

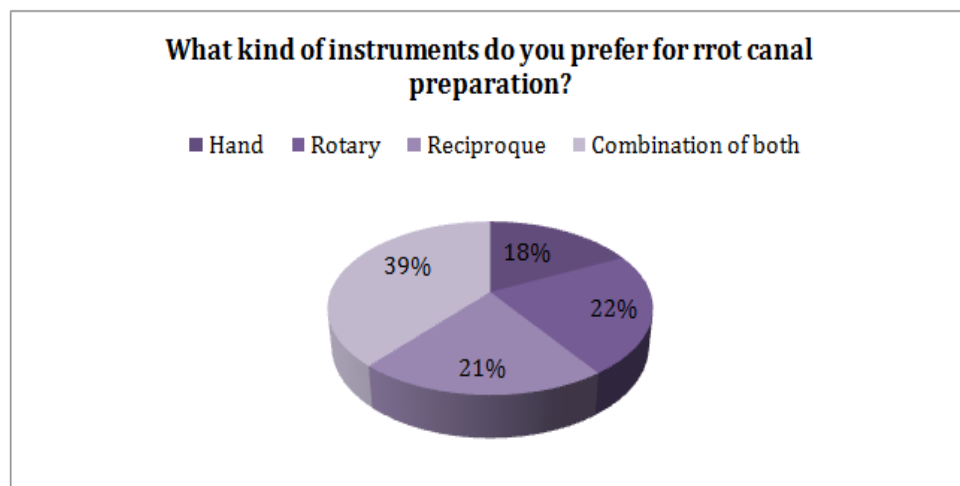


Figure 9. Root canal instrumentation files

48% of respondents use sodium hypochlorite up to 3% as the final solution for medication of the shaped, ready-to-fill root canal system, 29% of them use 90% alcohol, and 24% use EDTA.(Table 1). The respondents indicate that the instruments and the preparation techniques are considered when choosing an obturation method (65%), and 75% take into account the diagnosis of the tooth treated and the specificity of its anatomy.(Figure 10)

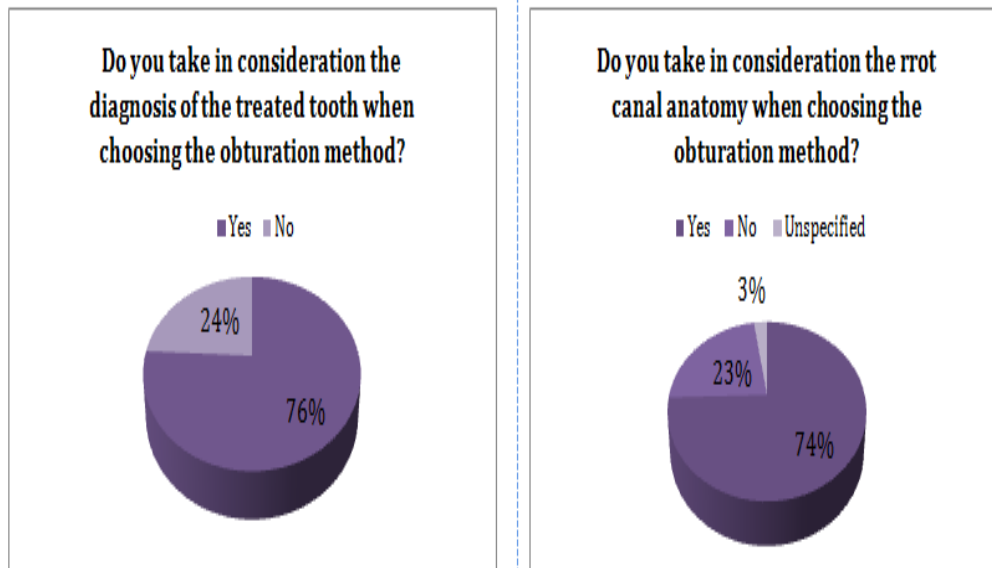


Figure 10. Rot canal obturation selection factors

Table 1. Final irrigation solutions

Solution	n	%
Sodium hypochlorite up to 3%	75	47.77
Sodium hypochlorite over 3%	9	5.73
90% Alchochol	45	28.66
Lemon acid	6	.82
EDTA	37	23.56
Hydrogen peroxide	52	33.12

The single-cone technique is indicated by 55% of the respondents, as the most commonly used by them method of root canal system obturation, 11% usually apply lateral condensation, 9% - warm vertical condensation.(Figure 11) Zinc oxide eugenol-based sealers and formalin-resorcinfilling pastes are still reported by the largest percentage of respondents, sharing 54% of the respondents. 27% of respondents reported resin-based sealers for most commonly used in their practice, 13% - calcium hydroxide sealers, and 9% reported bioceramic sealers.(see Table 2) 80% of the respondents indicated that they needed additional information on new means and methods for root canal obturation.

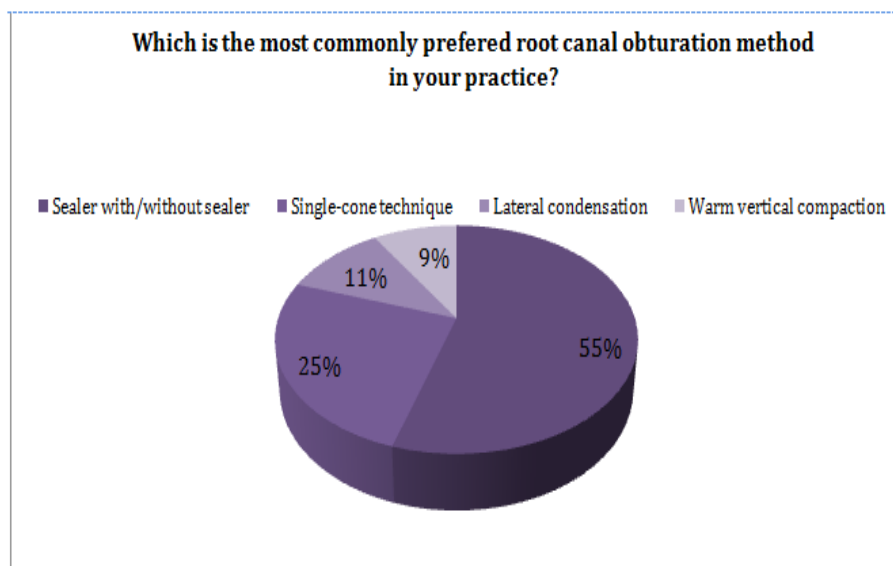


Figure 11. Root canal obturation methods

Table 2. Endodontic sealers

Sealers	n	%
Zinc oxide-eugenol	84	53.5
Foramlin-resorcin	84	53.5
Resin-based	42	26
Calcium-hydroxide	21	13.37
Bioceramics	14	8.92
Composite-based	3	1.91

The survey conducted in this way identified the main problems in the root canal system obturation, namely the application of modern methods and means for 3D hermetic seal. The results show that the complex clinical and anatomical situation creates difficulties in the root canal system obturation. Despite the evolution in the techniques of shaping, irrigation and obturating, the majority of practitioners use established in time methods and means of obturating the root canal space. The purpose of this survey is to gather information on the methods and means of obturating the root canal system as well as the difficulties in applying them. Questions included in the questionnaire seek to cover the main factors influencing the quality of obturation of the endodontic space, namely root canal anatomy, preparation, irrigation, materials and obturation techniques.

Of the dental practitioners surveyed, there is a strong prevalence in the group of over 15 years of service and about 2/3 of the respondents are women. This reflects on the whole of the information gathered, and covers this contingent of practitioners to a greater extent. This survey indicates a high incidence of endodontic treatment, but does not track the quality of the performed manipulations. Complex root canal anatomy creates the most difficulty among the respondents, which explains the weaker clinical results in multi-root teeth as well as in the presence of branches from the root canal. This seems to be the most significant factor in implementing the root canal system obturation procedures. The probable cause is the much more labor-intensive performance in the root canals with atypical anatomy, which is also associated with prolonged obturation time. 12% of dental practitioners use hand instrumentation and are not inclined to use more advanced engine driven techniques for shaping the root canal. It seems that new developments are slowly being incorporated into daily practice. Practitioners in Jordan and Denmark tend to use hand instruments and are not inclined to use more advanced engine-driven techniques for shaping of the root canal system [3, 4]. Several studies have shown the superiority of NiTi files over conventional instruments used for shaping the root canals [5]. The present study showed that 22% of respondents were using NiTi rotary files and 21% -NiTi reciprocate files for root canal preparation. This figure is similar to the results of another survey in Iran [6], but higher than the reported results by some other studies [7, 4, 8]. Faster and simpler preparation of root canals might be the reason for general practitioners using rotary instruments so commonly.

Thorough debridement of the root canal system cannot be achieved merely by mechanical means. Therefore, the use of an antimicrobial irrigant is strongly recommended [9]. In the present study, sodium hypochlorite is the most commonly used irrigant in the dental practices as a final wash solution. The aqueous solution of sodium hypochlorite in concentrations of 0.5% -5.25% is nowadays a gold standard in irrigation and cleaning of root canal system due to its antimicrobial and tissue-dissolving properties. This opinion was shared

by only 53% of our respondents, almost the same as results reported by Ravanshadet al. [7]. The current findings do not mirror the findings of Whitten et al. [10] and Clarkson et al. [9] who reported that more than 70% of the respondents were using NaOCl as an irrigant, while in surveys by Jenkins et al. [11], NaOCl was not used routinely.

In the current study, the single-cone technique, followed by lateral condensation significantly surpassed the other obturation techniques. It may be due to the fact that it is a relatively simple and versatile technique that does not require expensive equipment. Similar results were observed in many other studies [7, 12, 11, 4]. The reticence to choose some other obturation techniques including injection of warm gutta-percha, carrier-based techniques and continuous-wave method, might be due to possible mishaps during obturation, complexity of the techniques, relatively high initial cost and the need for more equipment compared to simplicity of the lateral compaction technique. On the other hand, in most universities single-cone technique and lateral compaction are the principally taught obturation techniques. Although single-cone technique cannot reliably fill the root canal space in all dimensions and is not recommended [13], 80% reported using a single-cone technique. It was interesting to note that 53% of the respondents were still using zinc oxide eugenol and formalin-resorcin root canal sealers. This finding is consistent with the results of another study conducted in Iran [7], whereas in studies conducted in Flanders and Turkey, resin-based root canal sealers were the most popular ones [1, 12]. This is mainly a problem with formalin-resorcin products, which can cause complications when in contact periapical tissues. Lack of interest in more modern sealers is probably due to their higher cost, as well as to the lack of awareness of the soon-to-be-proven products.

#### **IV. Conclusion**

The results of the survey conducted so far show that the complex clinical and anatomical situation creates the most difficulties in the root canal system obturation. Despite the evolution in the techniques of shaping, irrigation and obturating, the majority of practitioners have used established in time methods and means of obturating the root canal system.

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