

# Technical aspects of endodontic treatments performed by PMESP dentists: evaluation by means of a questionnaire

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## ABSTRACT

**Introduction:** Of all the specialties in dentistry, one of the most favored in recent years with the development of new technologies has been endodontics. **Objective:** This study aimed to obtain information on the technical aspects of endodontic treatments performed by dentists from the Military Police of the State of São Paulo, emphasizing the materials, equipment, and techniques used. **Methods:** A questionnaire with 25 multiple choice questions was sent to 147 dentists from PMESP and the inclusion criterion was professionals who performed endodontic treatment. **Results:** The statistical analysis was done through the chi-square test, with  $p < 0.05$ . The professionals evaluated 59.5% were male, the rubber dam was used in 54.8% of the cases, the working length by means of radiographs was obtained in 71.4%, the digital

sensor was used in 28.6%, the visual magnification was used in 23.8% and the lateral condensation technique was the most used with 90.2%. Another analysis was performed with 10 specialists of the Dental Center who performed only endodontic treatment, 50% were male, treated more than 15 cases/month, the rubber dike was used in 80% of the cases, the working length was performed in 50% of the cases by foraminal locator, the digital sensor was used in 90%, as well as the electric motor, the technique of lateral condensation was used in 60% of the cases and ultrasound 20%. **Conclusion:** It was concluded that the specialists used more new technologies and that the use of ultrasound and visual magnification was little used in both groups.

**Keywords:** Endodontics. Surveys and Questionnaires. Odontologists

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## Introduction

The success of the endodontic treatment is 97.7% results of periapical conditions after 1 year of preservation, as verified by radiography and when patients do not report any symptoms, in cases where patients have necrosis in the canal and bacterial infection, with periapical radiolucency, evidenced by radiography.<sup>2</sup>

Several studies have investigated the protocols of dental surgeons' care in various aspects of endodontic treatment, such as in Poland, Taiwan, England, Wales, Saudi Arabia, New Zealand, Turkey, United States, Lithuania, Denmark, United Kingdom, Serbia, Ireland, Sweden, Belgium, India, Nigeria, China,

and Iran. In Brazil, this was the first study of the endodontic practice with dentists of the Military Police of the State of São Paulo.

The purpose of this study was to obtain information on the technical aspects of endodontic treatments performed by dentists from the Military Police of the State of São Paulo, emphasizing the materials, equipment, and techniques employed.

## Material and methods

This research was approved by the Research Ethics Committee (opinion n. 1,921,750). A questionnaire was sent electronically to the 147 military dentists of the Military Police of the State of São Paulo,

Questionnaire	
<p>1. Do you perform endodontic treatment in the corporation? If no, please jump to question 23.</p> <p><input type="checkbox"/> Yes      <input type="checkbox"/> No</p> <p>2. What is your professional training?</p> <p><input type="checkbox"/> Endodontist    <input type="checkbox"/> General practitioner <input type="checkbox"/> Others</p> <p>3. How many cases of endodontics do you treat in your office per month on average?</p> <p><input type="checkbox"/> 1-5   <input type="checkbox"/> 6-10   <input type="checkbox"/> 11-15   <input type="checkbox"/> 16-20   <input type="checkbox"/> &gt;20</p> <p>4. What teeth do you routinely treat?</p> <p><input type="checkbox"/> Anterior   <input type="checkbox"/> Pre-Molars   <input type="checkbox"/> Molars   <input type="checkbox"/> All</p> <p>5. How often do you use a rubber dam?</p> <p><input type="checkbox"/> Always   <input type="checkbox"/> Usually   <input type="checkbox"/> Sometimes   <input type="checkbox"/> Never</p> <p>6. Do you use magnification?</p> <p><input type="checkbox"/> No    <input type="checkbox"/> Magnifier glass   <input type="checkbox"/> Microscope   <input type="checkbox"/> Others</p> <p>7. How do you determine the working length?</p> <p><input type="checkbox"/> Radiography   <input type="checkbox"/> Apical Electronic Locator   <input type="checkbox"/> Both</p> <p>8. Do you use a digital sensor?</p> <p><input type="checkbox"/> Yes    <input type="checkbox"/> No</p> <p>9. Which instrument do you use routinely?</p> <p><input type="checkbox"/> Type K   <input type="checkbox"/> Limes Hedstrom   <input type="checkbox"/> Manual NiTi                      <input type="checkbox"/> Limes Peeso</p> <p><input type="checkbox"/> Gates Glidden   <input type="checkbox"/> Rotary NiTi Limes   <input type="checkbox"/> Others</p> <p>10. Do you use an electric motor in instrumentation?</p> <p><input type="checkbox"/> Yes    <input type="checkbox"/> No</p> <p>11. If so, which system do you use?</p> <p><input type="checkbox"/> Protaper   <input type="checkbox"/> Mtwo   <input type="checkbox"/> Race   <input type="checkbox"/> K3   <input type="checkbox"/> Reciproc</p> <p><input type="checkbox"/> Waveone   <input type="checkbox"/> Others</p> <p>12. Do you patency the canal?</p> <p><input type="checkbox"/> Yes    <input type="checkbox"/> No</p>	<p>13. Which irrigation solution do you use routinely?</p> <p><input type="checkbox"/> Chlorhexidine 2%   <input type="checkbox"/> Saline                      <input type="checkbox"/> Anesthetic</p> <p><input type="checkbox"/> NaOCl(0.5-1%)   <input type="checkbox"/> NaOCl(2.5%)   <input type="checkbox"/> NaOCl(5.25%)</p> <p>14. Do you use any type of equipment for activation during irrigation? (Sonic, Ultrasound, Easyclean, EndoActivator)</p> <p><input type="checkbox"/> Yes    <input type="checkbox"/> No</p> <p>15. Do you remove the "smear layer"?</p> <p><input type="checkbox"/> Yes    <input type="checkbox"/> No</p> <p>16. Do you use ultrasound equipment during endodontic treatment?</p> <p><input type="checkbox"/> Yes    <input type="checkbox"/> No    <input type="checkbox"/> Sometimes</p> <p>17. In how many sessions do you routinely treat an endodontic case?</p> <p><input type="checkbox"/> Single Session   <input type="checkbox"/> Multiple Sessions</p> <p>18. Do you preserve your cases?</p> <p><input type="checkbox"/> Yes    <input type="checkbox"/> No</p> <p>19. What is the failure rate of your cases?</p> <p><input type="checkbox"/> 0%   <input type="checkbox"/> 5%   <input type="checkbox"/> 10%   <input type="checkbox"/> 15%   <input type="checkbox"/> 20% or &gt;</p> <p>20. Which sealer endodontic do you use routinely?</p> <p><input type="checkbox"/> Endofill   <input type="checkbox"/> Endomethasone   <input type="checkbox"/> AH Plus   <input type="checkbox"/> Sealer 26   <input type="checkbox"/> Others</p> <p>21. Which filling technique do you use the most?</p> <p><input type="checkbox"/> Lateral Condensation   <input type="checkbox"/> Cone Single   <input type="checkbox"/> Continuous Wave Technique</p> <p>22. How many years do you practice endodontics at PMESP?</p> <p><input type="checkbox"/> 1-5   <input type="checkbox"/> 6-10   <input type="checkbox"/> 11-15   <input type="checkbox"/> 16-20   <input type="checkbox"/> &gt;20</p> <p>23. Gender</p> <p><input type="checkbox"/> Male    <input type="checkbox"/> Female</p> <p>24. When did you join PMESP?</p> <p>25. What military unit do you work in, region?</p>

**Figure 1.** Questionnaire about materials, techniques and equipment used in endodontic treatments performed by dentists from the Military Police of São Paulo State.

with questions about the materials, equipment, and techniques used. Dental surgeons who performed endodontic treatment within the Corporation were included in this study and those who did not perform endodontic treatment were excluded. This methodology is little explored in Brazil, and this is an unprecedented work within the Corporation.

The validated questionnaire was similarly published<sup>3</sup> some adaptations were made, with a total of 25 multiple-choice questions, where some questions enabled more than one answer. All responses were anonymous and the informed consent form was obtained from all participants in this study.

The data was collected in the April-May 2017 period, the chi-square test was used through a regression model to verify absolute isolation use, treated dental group, use of magnification, digital imaging device, channel irrigation solution, number of sessions for endodontic treatment, type of instrumentation, working length, technique of shutting and use of new technologies. The models were adjusted by gender and years in endodontic practice. The level of significance was  $p < 0.05$ . The data were tabulated in a spreadsheet (Microsoft Excel 2016; Richmond, VA, USA). Statistical analysis was performed with the Statistical Package for Social Sciences software, version 13.0 (SPSS Inc.; Chicago, IL, USA).

## Results

Of the 42 professionals who were included in the survey 59.5% were male. Regarding professional training, 31% were endodontists, 28.6% general practitioners and 40.5% from other specialties.

The cases of endodontic treatment per month in the office were in the great majority of 1-5 cases as shown in table 1. The teeth treated by dental surgeons and which had more than one response were premolars (57.2%), incisors (57.1%), all teeth (28.6%) and molars (14.3%).

The results regarding the use of the rubber dam, use of visual magnification in the endodontic treatment, determination of the working length, use of instruments, irrigation solution, equipment for activation of the irrigation solution, use of ultrasound during the endodontic treatment, removal of "smear layer", sessions for endodontic treatment, preservation of cases, use of the obturator cement, the most used technique of plugging and the time of endodontic practice in PMESP are presented in Table 2.

The use of technologies for endodontic treatment according to gender and time of practice are presented in Table 3.

The use of technologies for endodontic treatment according to gender and time of practice is presented in Table 3.

We analyzed the results of 10 professionals at the C Odont, workplace (Fig 1) who perform endodontics exclusively and who served as the gold standard in the research, being 5 men and 5 women.

**Table 1.** Number of endodontic treatments performed per month.

	Absolute frequency n	Relative Frequency %	Value of N % p
1-5 treatments	23	54.8%	0.000
6-10 treatments	5	11.9%	
11-15 treatments	3	7.1%	
16-20 treatments	6	14.3%	
> 20 treatments	5	11.9%	

**Table 2.** Analysis of the various categories practiced by dentists.

Category	Classification	n	%	Value of p
Use of rubber dyke	Always	23	54.8%	0.000
	Habitually	7	16.7%	
	At times	9	21.4%	
	Never	3	7.1%	
Working length	No use	32	76.2%	0.000
	Use a magnifying glass	9	21.4%	
	Microscope	1	2.4%	
Use of digital sensor	Radiografia	30	71.4%	0.000
	Electronic finder	4	9.5%	
	Both of them	8	19%	
Use of electric motor	Yes	12	28.6%	0.005
	No	30	71.4%	
Electric motor system (only those that use)	Use of electric motor	13	31%	0.014
	Manual Instrumentation	29	69%	
Sistema de motor elétrico (somente os que usam)	Protaper Rotary	11	84.6%	0.013
	Reciproc	2	15.4%	
Channel Patency	Yes	23	54.8%	0.537
	No	19	45.2%	
Irrigation solution	Chlorhexidine	3	7.1%	0.000
	Physiological sound	3	7.1%	
	Anaesthetic	1	2.4%	
	NaOCl 1%	17	40.5%	
	NaOCl 2,5%	18	42.9%	
Equipment to activate the irrigation solution	Does use	3	7.1%	0.000
	Does use	39	92.9%	
Use of ultrasound	Does use	4	9.5%	0.000
	Does use	38	90.5%	
Removal of "smear layer"	Yes	32	80%	0.000
	No	8	20%	
Sessions for endodontic treatment	1 session	4	9.8%	0.000
	Several sessions	37	90.2%	
Prosevation of cases	Yes	28	66.7%	0.031
	No	14	33.3%	
Use of sealer endodontic	Endofill	16	38.1%	0.000
	Endomethasone	3	7.1%	
	AH Plus	15	35.7%	
	Sealer 26	4	9.5%	
	Others	4	9.5%	
Most used shuttering technique	Side Condensation	37	90.2%	0.000
	Single cone	3	7.3%	
	Continuous wave technique	1	2.4%	
Time and Endodontic Practice	1-5 years	9	21.4%	0.031
	6-10 years	5	11.9%	
	11-15 years	4	9.5%	
	16-20 years	8	19%	
	> 20 years	16	38.1%	

**Table 3.** Adoption of technologies according to gender and time of endodontic practice in PMESP.

	Gender			Practice time		
	Male	Female	p	<15 years	>15 years	p
Use of magnification	20%	29.4%	0.482	7.1%	32.1%	0.073
Use of digital sensor	24%	35.3%	0.426	28.6%	28.6%	1.00
Use of electric motor	20%	47.1%	0.063	21.4%	35.7%	0.345
Use of equipment for activation of solution	8%	5.9%	0.794	0	10.7%	0.204
Use of ultrasound	8%	11.8%	0.683	7.1%	10.7%	0.710

**Table 4.** Endodontic procedures extracted by the workplace.

	Workplace		p
	C Odont (n)%	Outros (n)%	
> 15 endodontic procedures/month	(9) 90%	(2) 6.5%	0.000
Uses absolute isolation	(8) 80%	(15) 48.3%	0.080
Use of magnification	(2) 20%	(8) 25.8%	0.710
Use of electronic locator magnUse	(5) 50%	(6) 20%	0.066
Use of digital sensor	(9) 90%	(3) 9.7%	0.000
Use of electric motor	(9) 90%	(4) 12.9%	0.000
Channel patency	(7) 70%	(16) 51.6%	0.308
Use of equipment to activate the solution	(1) 10%	(2) 6.5%	0.708
Remove smear layer	(10) 100%	(23) 74.2%	0.107
Use of ultrasound	(2) 20%	(2) 6.5%	0.209
Treatment in a single session	(3) 30%	(1) 3.3%	0.015
Does preservation	(7) 70%	(21) 67.7%	0.894
Unsuccessful 15%	(1) 14.2%	(0) 0%	0.046

## Discussion

The endodontic practice questionnaires in several countries report that new technologies have been little used in endodontic treatment<sup>4,7</sup> and are also equivalent to the results of this study, regarding the use of electric motor in mechanized instrumentation, use of digital sensor, use of visual magnification, electronic locator, equipment for solution activation and use of ultrasound. In the group of specialists of the dental center, the results show a trend towards the adoption of new technologies, with the exception of the use of ultrasound, equipment for solution activation and visual magnification that was low for both groups.

Like the C. Odont is a specialty center, most cases end up being referred by dentists to this center, mainly complex cases and with that, the financial resources for equipment and materials acquisition are directed there. As an example, there are 02 operative microscopes, one exclusive in the Department of Endodontics (Fig 2) and another in the Department of Surgery that serves to perform parentodontic surgery (Fig 3).

The survival rate of 01, 05 and 10 years in the endodontic treatment of anterior teeth and premolars has no statistical difference when compared with specialists and dentists, but in the case of molars, the survival rate is lower when treated by dentists.<sup>8</sup> The vast majority of



**Figura 2.** Microscópio operatório Opto.



**Figura 3.** Microscópio operatório usado no Departamento de Cirurgia.

dentists do not treat molars. Due to the higher number of endodontic cases treated by specialists (90%) treat more than 15 cases/month compared to dentists (6.5%), the chance of failure will be higher, although all necessary resources such as materials, equipment and techniques are employed.

Regarding the use of some equipment to increase the visual field (magnification), the two groups presented a result in the range of (80%) specialists and (74.2%) dentists who do not use either an operative microscope or a magnifying glass and the need for the use of visual magnification,<sup>9</sup> especially in this study, where most professionals have been practicing endodontics in PMESP for over 20 years. The isolation of the tooth with rubber dam is a procedure of utmost importance for infection control in endodontic treatment. Studies<sup>10-14</sup> indicate that the use of the rubber dam was relatively low and is in line with the result found in the group of dentists who always use (48.3%), different from the group of specialists of the C Odont who was (80%) who always use. The adoption of technologies is more employed by specialists (46.6%) against (13.5%) of dentists and the female gender and professionals with more practice time are the ones who use more.

The realization of apical patency was another issue addressed in this study. The maintenance of the apical patency improves the delivery of the irrigator in the apical third.<sup>15</sup> The patency procedure, during the endodontic treatment, prevents the accumulation of dentin scrapings that can compromise the preparation of the apical third. The results indicate that (51.6%) of the group of dentist surgeons make the canal patency against (70%) of the group of specialists of C Odont., the search for apical patency becomes necessary to achieve better results in endodontic treatment, especially in infected canals. The manual or mechanized instrumentation acts in a similar way in the elimination of bacteria from the endodontic system,<sup>16</sup> in this study (87.1%) of the dentists use manual files in the instrumentation of the canals and the specialists of the C. Odont., (90%) use automated systems and are able to attend a greater number of cases than the dentists, there is no difference between the rotating and reciprocating system in the preparation of the canal,<sup>17</sup> being used in this study (84.6%) by the specialists the rotating system Protaper.

The most widely used irrigator in this study was NaOCl and according to works<sup>18-21</sup> there are no significant differences between NaOCl and CHX, but that NaOCl should be changed regularly and used in large quantities to maintain antibacterial effectiveness regardless of concentration. EDTA or Citric Acid is also used as channel irrigation for smear layer removal.<sup>22</sup> Using 17% EDTA, approximately half of the debris accumulated in the instrumentation would remain in the root canal system if activation of the irrigation solution (PUI) was done<sup>23</sup> and what we did not observe in this study is how smear layer removal is being done, since activation of the irrigation solution is done by (10%) in the group of specialists and (6.5%) in the group of dentists.

A systematic review study of the endodontic treatment in one and several sessions showed similar repair or success rate regardless of the condition of the pulp or periapical.<sup>24</sup> Endodontic treatment is a specialized procedure most required by patients in public oral care in the country and by performing in a single session, it is possible to obtain better cost-effectiveness for patients and professionals.<sup>25</sup> In this study, endodontic treatment was performed mostly in several sessions in both groups, (70%) in specialists and (96.7%) in dentists. The most used sealer endodontics by dentists was eugenol, for its cost and ease of acquisition. In the group of specialists, a resin cement considered “gold standard” was used (100%) due to the complexities of the cases that are referred.

Dentistry currently moves towards evidence and is considered the gold standard in patient care. Therefore, adequate training combined with the use of technologies certainly contribute to the success of endodontic treatment. This study has allowed the approach of a significant number of dentists from PMESP who perform endodontic treatment, which is

mainly due to the ease of access of participants to the questionnaire. On the other hand, the fact that the study was based on the application of a questionnaire can be considered a limitation, since no direct observation of the procedures performed by the participating professionals was performed, but despite the limitations of the study, the results will be important to serve as a guide for the standardization of procedures in the future, aiming to improve the quality of the service provided within the Corporation with respect to endodontic treatments.

## Conclusion

According to the present study, it was possible to conclude that dentists at PMESP work in different ways following different parameters, without having a single protocol to be followed in the institution. Therefore, the adequacy of the techniques employed is necessary, especially in relation to apical patency and the removal of “smear layer”.

According to the literature studied, the use of new technologies such as ultrasound, visual magnification resources, electronic foraminal locator, electric motor and digital sensor, mainly for use in cases of greater complexity, offer greater safety and quality in the treatments performed.

The low use of absolute isolation was another important factor to be highlighted, given its consolidated importance to ensure protection against contamination during the treatment, in addition to providing greater safety to the patient and professional avoiding contact and swallowing of harmful chemicals and instruments.

It is clear that updates and continued training are essential for clinical evolution, promoting contact with new technologies and studies that highlight new discoveries and new applications within the dental specialty.

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