Scholars Journal of Dental Sciences (SJDS) **ISSN 2394-496X (Online)**
Sch. J. Dent. Sci., 2016; 3(2):51-57 **ISSN 2394-4951 (Print)**

(An International Publisher for Academic and Scientific Resources)
www.saspublishers.com DOI: 10.36347/sjds.2016.v03i02.002

Original Research Article

Survey of Attitudes, Materials and Methods Preferred in Root Canal Therapy by Dentists in Palestine

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Abstract: Procedure related factors define the success of root canal procedures in majority of the cases. While there are several guidelines available, the compliance rate is substantially low. This study evaluates the attitudes, materials and methods preferred in root canal therapy by dentists in Palestine. An online self-administered questionnaire was sent to 200 Palestinian dentists. The questionnaire consisted of a total of 21 questions with multiple choice answers subdivided under general information, general approach to endodontic process, disinfection of root canal and root canal obturation and approach to access cavity restoration. Only about 6% of the dentists stated that they always used rubber dam, with saliva ejector or cotton rolls the most preferred isolation method. Majority of the dentists never used magnification and about 41.17% of them frequently detected and treated a fourth canal. Step-back technique was mostly preferred while K file was most preferred for RCT preparation. Apex locator was the most preferred method of determination of the working length (34%) followed by tactile sensation. Sodium hypochlorite (NaOCl) was the most preferred root canal irrigant and 4% was the most preferred concentration among majority of the dentists. Most preferred use of lateral condensation, gutta percha (GP) with sealer (68.19%). Overall, composite was the most preferred choice for final restoration. Endodontic procedures being followed by majority of the Palestinian dentists were different from those recommended in standard guidelines and evidence based studies. Nevertheless, the findings of this study may be useful as baseline data for future studies.
Keywords: root canal procedures, gutta percha (GP), sealer

INTRODUCTION

The long term success of endodontic therapy depends not only on preoperative status of the pulp and periapical tissues but also on a number of procedure related factors [1]. Root canal instrumentation length and level of root filling have been reported to significantly affect the treatment outcome [1] and it is generally agreed that inadequate treatment is one of the most common causes of root canal treatment (RCT) failures [2]. Although guidelines such as those from the European Society of Endodontology help dentists choose the right treatment according to the current acceptable standards in clinical endodontics [3], a disparity in the methods followed does exist. Although several studies have evaluated the dentists' attitudes and practices while performing endodontic therapy across the world, there are currently no such specific studies which have assessed the attitudes of Palestinian dentists regarding RCT procedures. The current study was hence carried out to understand the attitudes and practices of the dentists in Palestine regarding endodontic therapy and to evaluate whether there were any differences based on their gender, years of experience and type of practice.

MATERIALS AND METHODS

This study was carried out among Palestinian dentists by means of an online self-administered questionnaire in 2012. Two hundred dentists registered with the Palestine Dental Association were randomly selected and the questionnaire was e-mailed to them.

The questionnaire used in this study was adapted from a similar study performed in Turkey, with slight modifications [4]. A total of 21 questions with multiple choice answers comprised the questionnaire used in the current study. The questions were subdivided under 4 main categories.

General information: Gender, type of practice, years of experience and frequency of root canal therapy (RCT) General approach to endodontic process: Isolation methods followed (including rubber dam), use of magnification, detection of fourth canal in a maxillary molar, choice of preparation technique, instrument choice and frequency, method of determination of the working length and choice of devitalizing agent

Disinfection of root canal: Preference of root-canal irrigants, concentration of sodium hypochlorite used, use of side-perforated needles and intracanal medicament chosen

Root canal obturation and approach to access cavity restoration: Root canal obturation technique chosen, choice of sealer, choice of temporary filling material and material used for final restoration

Contingency tables were used to evaluate the data obtained and conclusions were drawn through Chi-squared distribution test with p-value as supplement. Preferences were also categorized based on gender, type of practice and years of experience. All the statistical analyses were performed using the SPSS ver. 13 statistical software (SPSS Inc, Chicago, IL, USA).

RESULTS

Of the 200 questionnaires distributed, 165 dentists completed them and returned (83% response rate). Majority of the responders were males (67.27%), private practitioners (94.54%), and had been practicing since 0-5 years. The number of RCTs performed per month by majority of the dentists ranged between 1-9. The results obtained have been discussed in terms of overall scores (an average score taking into consideration gender, type of practice, years of practice and number of RCTs completed every month) and in terms of individual parameters. Table 1.

Table 1. Demographic data

Gender	
Male	111(67.27)
Female	54 (32.72)
Type of practice	
Private	156 (94.54)
Public	2 (1.21)
Private/Public	7 (4.24)
Years of practice (years)	
0-5	91(55.15)
6-10	35 (21.21)
11-15	18 (10.90)
16-20	11(6.66)
>20	10 (6.06)
Number of RCTs performed per month	
1-9	58 (35.15)
10-19	43 (26.06)
20-29	24 (14.54)
30-39	4 (2.42)
>40	30 (18.18)

General approach to endodontic process

Overall, while only about 6% of the dentists stated that they always used rubber dam, 55% reported that they never used rubber dam during endodontic procedures. When gender was considered, majority of the male and female dentists surveyed mentioned that they never used rubber dam during the endodontic procedures (63% and 46%, respectively; Table 2).

The highest 'frequent use' of rubber dam, when years of professional experience were considered, was noted among those with 6-10 years of experience (34%). Similarly, it was highest among those in private/public practice (57%) and among those who completed 30-39 RCTs per month (44%).

In terms of the use of magnification during endodontic procedures in the overall surveyed population, majority of the dentists never used magnification (96%). In terms of gender, majority of both males and females did not use magnification (94% and 98%, respectively; Table 2) during endodontic procedures. The use of loupe magnification was highest when the dentists had been practicing for 16-20 years (36%) and completed more than 40 RCTs per month (23%).

Saliva ejector or cotton roles were used by both male and female dentists as the most preferred isolation method (49% and 48%, respectively). Regardless of experience and the number of RCTs per month, saliva ejector/cotton roll was the mostly used isolation method. Overall, saliva ejector/cotton roll was mostly opted for isolation (48%); followed by saliva ejector (22%), cotton roll (21%) and rubber dam (7%).

There was a correlation in the manner that male and female doctors with the experience less than 5 years and who completed 1-9 RCT's per month, never used rubber dam, did not use magnification and mostly used cotton roll/saliva ejector as isolation.

Overall, while about 38.34% of the dentists rarely detected a fourth canal in a maxillary molar, about 41.17% of them frequently detected and treated a fourth canal. About 19.57% of the dentists reported that they always detected and treated a fourth canal; this was highest among those with 16-20 years of experience (63.64%).Detecting and treating a fourth canal in a maxillary molar was evenly distributed among gender. It was noted that the chances of detecting a fourth canal was higher with more experience and with more number of RCTs completed per month.

Among the overall scores for the root canal preparation technique chosen, step-back technique was mostly preferred (75%) compared to crown down method (13.6%). When years of professional experience were considered, step-back was mostly preferred by those with 0-5 years of experience (81.32%), while crown down technique was mostly preferred by those with an experience of 16-20 years (36.36%).

Nevertheless, a higher percentage of dentists preferred the step-back method regardless of the year of experience.

In terms of instrument of choice among the overall population, while K file was most preferred (22.5%), NiTi Hand instrument was the least frequently used (4.58%). In case of gender based preferences, while male dentists evenly used H files, K files and NiTi rotary instruments, female dentists' mostly preferred K files (31.48%). The usage of Ni-Ti rotary instrument was highest among those with 6-10 years of experience (42.86%), 16-20 years of experience (36.36%) and those who completed >40 RCTs per month (43.33%). Private sector had more diversification in using instruments, while public sector used only H and K file types.

When enquired specifically about the usage of NiTi rotary instruments, it was 'rarely used' by about 29.18% of the dentists while it was 'always used' by about 24.62% of the dentists. The use of rotary instruments increased as experience and number of RCTs completed per month increased.

In general, considering all the parameters, apex locator was the most preferred method of determination of the working length (34%) followed by tactile sensation (20.5%) and radiographs (14.61%). Radiographs along with apex locator were preferred by about 12.8% of the dentists. The most preferred method of determination of the working length among females was apex locator (48.15%) while majority of the males preferred tactile sensation (24.32%). It terms of experience, apex locator was majorly used by those with >20 years of experience (50%) while tactile sensation was mostly preferred by those with 11-15 years of experience (44.44%). Further, apex locator was more commonly used by dentists who completed 1-9 RCTs per month (46.55%) than others. More experienced dentists rely on apex locator, while less experienced dentists relied on tactile sensation.

Aldehyde based devitalizing agents were the most preferred (63.71%) while arsenic based was least preferred (0.64%) among all dentists. Use of aldehyde did not vary based on gender, type of practice, years of experience or number of RCTs performed every month.

Disinfection of root canal

Overall, sodium hypochlorite (NaOCl) was the most preferred root canal irrigant (42.19%) while ethylene diaminetetra acetic acid (EDTA) was the least preferred (1.85%). While female dentists mostly preferred NaOCl as irrigant, male dentists were more diversified in their choices. Nevertheless many dentists opted for more than one choice of root canal irrigant and hence a clear majority was not arrived at among the individual irrigants.

In terms of the concentration of NaOCl used for irrigation by the overall population, 4% was the most preferred concentration (26.53%) while 0.5% and 1% were the least preferred (0.90%). Interestingly, about 11.11% of females and 3.60% males did not know the concentration of NaOCl being used for irrigation. Further, about 2.73% dentists mentioned that they never used irrigation during endodontic procedures. Regardless of type of practice, a concentration between 2.5% and 4% was preferred by most dentists.

Overall, side-perforated needles were being used during endodontic procedures by 34.4% of the dentists. In terms of experience it was evenly preferred by those with 0-5, 11-15 and 16-20 years of experience, while those with >20 years of experience did not use it. Overall, when gender, years of experience, type of practice and number of RCTs completed per month was considered, majority of the dentists did not use side-perforated needles.

Antibiotic based medicaments were the most commonly preferred intracanal medicaments among all the dentists (40.6%) followed by calcium hydroxide (14.2%) while steroid based ones were least preferred (0.5%). The choice for antibiotic based intracanal medicament was uniformly distributed among all dentists regardless of gender, type of practice, years of practice and number of RCTs per month. Some of the other medicaments preferred to a lesser extent included eugenol (9.6%), iodoform (6.9%), and tricresol formalin (5%). Interestingly, about 6.4% of the dentists did not use any intracanal medicaments.The results are summarized in table 3.

Root canal obturation and approach to access cavity restoration

Overall, majority of dentists preferred use of lateral condensation, gutta percha (GP) with sealer (68.19%) while use of thermafil was the least preferred root canal obturation material/method (0.93%). The lateral condensation, GP with sealer were preferred by both males and females, and by all dentists regardless of number of RCTs performed per month. Interestingly, dentists with 16-20 years experience preferred to use one cone technique with sealer or thermafil.

Endomethazone sealer was the most preferred sealer among all dentists (45.67%) while zinc oxide eugenol + iodoform, was the least preferred (0.90%). Both male and female dentists mainly preferred endomethazone sealer. While dentists with more than 20 years of experience preferred AH26 sealer, all others

preferred endomethazone sealer. All dentists involved in public practice preferred Sealapex sealer.

Among the provided options for the choice of temporary filling material, Cavit/ any temporary filling was most frequently chosen (63.91%) while zinc phosphate was least preferred (0.9%). Cavit/any temporary material was preferred regardless of gender and number of RCTs performed per month. However, dentists with 16-20 years of experience mostly preferred IRM-zinc oxide eugenol.

Overall, composite was the most preferred choice for final restoration (21.47%) while amalgam was preferred by only 12.81% of the dentists. In terms of gender, females mostly preferred crown as the final restoration (33.33%) while males preferred composite as the final restoration material (20.72%). A clear distinction related to the material of choice was not possible as the surveyed members had chosen more than one option for this question.

Table 2. Results related to questions about use of rubber dam, magnification, detection of fourth canal and root canal shaping technique

Parameters		Do you use rubber dam?			Do you use magnification?			Do you detect and treat a fourth canal in a maxillary molar?				What is your choice of preparation technique	
		Always	Frequently	Never	Rarely	Loupe	No	Always	Frequently	Never	Rarely	Crown Down	Step Back
Gender	Female	7%	22%	46%	24%	2%	98%	14.81%	46.30%	1.85%	37.04%	5.56%	83.33%
	Male	5%	14%	63%	18%	6%	94%	24.32%	36.04%	0.00%	39.64%	21.62%	66.67%
How many years have you been in profession al activity?	0-5	2%	13%	56%	29%	1%	99%	20.88%	31.87%	0.00%	47.25%	9.89%	81.32%
	6-10	11%	34%	43%	11%	6%	94%	14.29%	68.57%	0.00%	17.14%	17.14%	74.29%
	11-15	11%	11%	78%	0%	0%	100%	22.22%	44.44%	0.00%	33.33%	33.33%	55.56%
	16-20	0%	0%	73%	27%	36%	64%	63.64%	0.00%	0.00%	36.36%	36.36%	36.36%
	more than 20	10%	20%	70%	0%	10%	90%	0.00%	40.00%	10.00%	50.00%	20.00%	50.00%
What is your working situation?	Private	6%	15%	59%	20%	5%	95%	20.51%	39.10%	.64%	39.74%	16.67%	72.44%
	Private;Pu blic	0%	57%	43%	0%	0%	100%	28.57%	42.86%	0.00%	28.57%	0.00%	71.43%
	Public	0%	0%	0%	100%	0%	100%	50.00%	50.00%	0.00%	0.00%	50.00%	50.00%
How many RCTs do you complete per month?	0	0%	0%	100%	0%	0%	100%	0.00%	0.00%	0.00%	100.00%	0.00%	100.00%
	1-9	3%	31%	50%	16%	2%	98%	8.62%	41.38%	0.00%	50.00%	13.79%	72.41%
	10-19	0%	5%	63%	33%	0%	100%	13.95%	46.51%	2.33%	37.21%	20.93%	79.07%
	20-29	8%	0%	71%	21%	0%	100%	29.17%	25.00%	0.00%	45.83%	16.67%	66.67%
	30-39	0%	44%	56%	0%	0%	100%	11.11%	33.33%	0.00%	55.56%	0.00%	66.67%
	>40	17%	13%	53%	17%	23%	77%	53%	40%	0	7%	0.2	67%

Table 3. Preferred choice of root canal irrigants distributed in terms of gender, type of practice, years of experience and number of RCTs performed every month.

		Chlorhexidine	EDTA	H2O2	NaOCl	None	Normal saline
Gender	Female	5.56%	3.70%	3.70%	55.56%	1.85%	0.00%
	Male	4.50%	0.00%	0.00%	28.83%	.90%	6.31%
Type of Practice	Private	5.13%	1.28%	1.28%	36.54%	1.28%	4.49%
	Private; Public	0.00%	0.00%	0.00%	57.14%	0.00%	0.00%
	Public	0.00%	0.00%	0.00%	50.00%	0.00%	0.00%
Years of Experience	0-5	8.79%	2.20%	2.20%	40.66%	0.00%	5.49%
	6-10	0.00%	0.00%	0.00%	48.57%	0.00%	0.00%
	11-15	0.00%	0.00%	0.00%	11.11%	0.00%	0.00%
	16-20	0.00%	0.00%	0.00%	36.36%	18.18%	0.00%
	more than 20	0.00%	0.00%	0.00%	20.00%	0.00%	20.00%
Number of RCTs per month	1-9	8.62%	3.45%	0.00%	37.93%	0.00%	3.45%
	10-19	6.98%	0.00%	4.65%	34.88%	4.65%	0.00%
	20-29	0.00%	0.00%	0.00%	33.33%	0.00%	8.33%
	30-39	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
	>40	0.00%	0.00%	0.00%	53.33%	0.00%	10.00%

DISCUSSION

There is currently a lack of studies which have specifically evaluated the attitudes of Palestinian dentists regarding different procedures followed routinely in dental practice. This study evaluated the attitudes and beliefs of these dentists in the field of endodontics.

The response rate could be considered to be excellent with over 80% of the dentists responding to the survey. Majority of the responders were males (67.27%), were involved in private practice (94.54%), and had been practicing since 0-5 years (55.15%). The study population also included dentists who were practicing for more than 6 years with a few of them in dental practice for over 20 years. Accordingly, it can be said that the current study was able to gather responses from all quarters of dental practitioners in terms of years of professional experience.

Although various accredited organizations have come up with evidence based guidelines to be followed during endodontic procedures [3] it can be said that many dentists do not follow all the listed guidelines.

Isolation of the tooth being treated is one of the important steps for ensuring clear working field and minimizing the risk of infection. The use of rubber dam during endodontic treatment is considered essential as it helps in preventing several risks including salivary and bacterial contamination of the tooth being treated, accidental inhalation and ingestion of instruments and ingestion of irrigating solutions escaping into the oral cavity [3] However, questionnaire based studies have revealed that about 70% of dentists do not always use a rubber dam [5]. In a Turkish study, rubber dam was the preferred isolation method of only 5.1% of the respondents [6].

Similarly, in the current study, 5% of the dentists stated that they always used rubber dam while about 58% of the dentists never used rubber dam during endodontic procedures (saliva ejector/cotton roll was the most preferred isolation method followed). It was also noted that while beginners try to use rubber dam, with experience it faded. Nevertheless, dentists with 6-10 years of experience and those who completed 30-39 RCTs per month reported ‘frequent use’ of rubber dam. On the other hand, dentists working in private sector rarely used rubber dam.

The reasons often cited for not using rubber dam include concerns regarding patient acceptance, application time, equipment and material cost, lack of proper training, difficulty in use and low fees being collected for treatment [7].

Magnification was not used frequently during endodontic procedures by majority of surveyed Palestinian dentists. Nevertheless, dentists who had been practicing for 16-20 years and those who completed more than 40 RCTs per month reported frequent use of loupe magnification during endodontic procedures. The benefits of using magnification during endodontic procedures according to certain studies include better visualization of the treatment field, improved chances of locating the canals, easier identification of separated instruments, identification of root and tooth fractures, and perforation repair [8]. However, the true impact on the success rates of endodontic procedures performed using magnification devices when compared to conventional methods is yet to be ascertained [9]. This may be one of the reasons for lack of widespread use of magnification. Other possible reasons could include lack of familiarity with the type and depth of magnification required, space required for the instrument and the concerns about cost effectiveness of the equipment [10].

There was no significant difference between the number of dentists who were either able to or not able to detect a fourth canal in the maxillary molars in the current study. Similarly, in the Turkish study, fourth canal was detected only in a few cases with 58.3% respondents reporting that they rarely detected and treated fourth canal in maxillary molars [4].

In the current study, compared to other dentists, a higher percentage of dentists with an experience of 16-20 years reported that they ‘always’ detected a fourth canal in maxillary molars. Interestingly, the use of loupe magnification was also highest among these dentists. It could hence be said that loupe magnification increased the probability of detecting fourth canals in maxillary molars in the surveyed population.

While it has been stated that failure to recognize and obturate all the canals is one of the major cause of RCT failure, [11] there seems to be a lack of studies which have specifically compared the success rate of cases where the fourth canal was identified and filled with cases in which it was not detected.

For preparation of the root canal, step-back technique was mostly preferred by the surveyed dentists. While step-back was mostly preferred by those with 0-5 years of experience, crown down technique was mostly preferred by those with an experience of 16-20 years. In the overall population, while K file was most preferred for preparation of the root canals, NiTi Hand instrument was the least frequently used. In terms of gender, male dentists evenly used H files, K files and NiTi rotary instruments, while female dentists’ mostly

preferred K files. The use of Ni-Ti rotary instrument was highest among those with 6-10 years of experience and those who completed >40 RCTs per month. It was 'always used' by about 23.67% of the dentists.

Similarly, in a Turkish study, K-files were mostly preferred either solely or in combination by 73% of the surveyed dentists, while about 79.7% of them used Ni-Ti hand or rotary files [6]. The practitioners in India also preferred hand instruments for cleaning and shaping the root canals (39%) with step-back and crown down both being followed commonly (35%) [12]. In a survey conducted in UK, almost half of the surveyed practitioners preferred step-back technique [13].

According to the guidelines released by the European Society of Endodontology, electronic and radiographic methods are the preferred methods of determining the working length of a tooth during RCT [3]. In accordance, apex locator was the most preferred method of determination of the working length in the current study. While this was the preferred method among females, majority of the males preferred tactile sensation. In terms of experience, apex locator was majorly used by those with >20 years of experience and by those who completed 1-9 RCTs per month. In the Turkish study by Unal et al, radiographs were the most preferred method of working-length determination [6].

Devitalizing agents are often used for devitalization and disinfection of the root canal when local anesthesia is ineffective [14]. The respondents of the current study mostly preferred aldehyde based devitalizing agents in such cases. In the Turkish study, 44% of the respondents reported using arsenic based or aldehyde based devitalizing agents [6]. However, the European Society of Endodontology advises against the use of materials containing toxic components for devitalization of the pulp [3]. Additionally, the use of devitalizing agents such as paraformaldehyde can provoke adverse effects such as gingival and maxillary bone necrosis, while formaldehyde is an allergen which can cause contact dermatitis. Hence the use of such devitalizing agents has been strongly discouraged [15].

Root canal irrigants are deemed necessary to eradicate microorganisms, wash out dentinal debris, lubricate endodontic instruments and dissolve organic debris [3]. Sodium hypochlorite (NaOCl) was the most preferred root canal irrigant among the surveyed dentists in the current study and most preferred concentration was 2.5%. This was the preferred irrigant in both the Turkish and Indian studies [6, 12]. Interestingly, few of the surveyed dentists in the current study did not know the concentration of NaOCl being used for irrigation in their clinics. Ethylene diamine tetra acetic acid at a concentration of 17% was noted to produce the cleanest dentinal surface in a scanning electron microscope analysis performed to compare the efficacy of irrigant solutions. Further, while 5% NaOCl and 3% hydrogen peroxide were reported to be efficient in removing organic debris, they are unable to remove smear layer [16]. However, in the current study EDTA was the least preferred root canal irrigant.

In comparison to the Turkish study, a higher number of dentists in the current study preferred side-perforated needles for irrigation of the root canals (10.5% vs 34.4%).[4] However, majority of the Palestinian dentists (65.1%) reported that they did not use side-perforated needles.

Intracanal medicaments are often used for interim dressings during multi-visit treatments [17]. Accordingly, antibiotic based intracanal medicaments were preferred by most of the surveyed dentists. However, in other similar studies conducted in the UK [18], USA [19], and India [12] the most preferred intracanal medicament was calcium hydroxide.

For obturation, majority of dentists in the current study preferred use of lateral condensation, gutta percha with sealer while dentists with 16-20 years experience preferred to use one cone technique with sealer. While endomethazone was the most preferred sealer among all dentists, those with more than 20 years of experience preferred AH26 sealer.

Lateral condensation with GP points was the most common method in the Indian (61%) and a Flemish study (60%) [12, 20]. However, lateral compaction of GP was reportedly associated with more dentinal defects than passive GP obturation in a study evaluating dentinal defects before and after rotary root canal instrumentation with three different obturation techniques [21].

Cavit/ any temporary filling was most frequently chosen for filling the access cavity following obturation in the current study and composite was the most preferred choice for final restoration. Similar findings were reported in the Turkish study by Kaptan et al [4].

Clear conclusions related to some of the endodontic practices in the current study could not be arrived at for several questions as many respondents chose more than one option. This could be considered as one of the limitations of this study. However, the outcomes obtained in the current study do reflect the attitudes of a significant section of the dentists practicing in Palestine.

CONCLUSION

Endodontic procedures being followed by majority of the Palestinian dentists were different from

those recommended in standard guidelines and evidence based studies. This was specifically true in terms of use of rubber dam, root canal irrigant, devitalizing agents and condensation method of gutta percha. Further, there was a gender and experience based disparity noted in several procedures.

Till date there are no similar studies in the field of endodontics involving Palestinian dentists. Hence a comparison between the earlier and current practices cannot be made. Nevertheless, the findings of this study may be useful as baseline data for future studies. Additionally, the findings of this study may help in identifying the needs of Palestinian dentists in terms of continued education and training related to use of certain procedures or materials in endodontics.

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