



## Research Article

# Current trends in endodontic practice, adaptation to new technologies and attitude of dental practitioners towards endodontic standards in Sri Lanka

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## ABSTRACT

**Objectives:** The study were to describe the current endodontic practices among the dental surgeons in Sri Lanka, and to determine the association between years of practice and choice of endodontic materials and equipment. **Materials and Methods:** A postal survey was conducted to assess the current trends in endodontic practice, adaptation to new technologies and attitude of dental practitioners towards endodontic standards in Sri Lanka. Data were analyzed using SPSS 20. **Results and Discussion:** The total response rate was 38.75%. Most of the respondents were females (58.5%), with only a bachelor degree (63.9%) and practicing in the government hospitals (80.4%). The majority preferred to complete endodontic treatment within 3 appointments. Low level of rubber dam use was a striking feature noted. Most of them used manual instruments manipulated with a filing technique. A high percentage (MWP-63.2% PP- 61.3%) used tactile sensation as a method of working length determination and only a few (MWP-21.8% PP-32.8%) used apex locators. The first choice of root canal irrigant was sodium hypochlorite (MWP-76.4% PP-80.4%). The most popular obturation technique was cold lateral condensation in the MWP as 57.7% and 58.3% in the PP. The majority seem to overuse antibiotics. None of the respondents in the PP used endodontic microscopes but 12.3% used intraoral cameras. There was a significant correlation ( $p < 0.05$ ) between using rubber dam in the MWP and using Ni-Ti rotary instruments, using K files, performing step-back technique, using sodium hypochlorite root canal irrigant in the PP, with years of professional activity. **Conclusion :** The results of this study shows that the standard guidelines and new technologies for endodontic treatment are not implemented by many practitioners of Sri Lanka and the importance of continuing dental education for practitioners to update their knowledge.

**Keywords:** Attitude; Dental Surgeons; Endodontology; Guidelines

## 1 INTRODUCTION

Endodontic therapy is a highly sought treatment modality in current dental practice. It includes all clinical procedures designed to maintain the teeth in a functional state in the dental arch by treating or preventing apical periodontitis, the principle disease.<sup>(1)</sup> Endodontics saw a gradual evolution to what it is today due to the discovery of local anesthesia by William Halsted in 1885, Guttapercha by G.A. Bowman in 1867 and X rays by Wilhelm Roentgen in 1895.<sup>(2)</sup>

Modern endodontics encompasses the management of orofacial pain, pulp therapy to preserve the health of the

pulp, root canal treatment and retreatment, management of post-treatment endodontic disease, surgical endodontics, bleaching of endodontically treated teeth, treatment procedures related to coronal restorations using a core and a post involving root canal space and endodontically related measures in connection with crown lengthening and forced eruption procedures.<sup>(3)</sup>

Contemporary endodontics involves the introduction of many new instruments, devices, materials and techniques.<sup>(4)</sup> With the development of these technologies and skills, the quality of endodontic treatment has increased leading to

higher endodontic success rates and many teeth with a guarded prognosis which used to be extracted in the past are now salvaged by nonsurgical or surgical endodontic treatment.<sup>(5)</sup>

It is important to know that the outcome of endodontic treatment depends not only on specific factors like root canal infection, the complexity of root canal morphology, etc but is also influenced by less specific and more distinct individual causes such as dentist's knowledge skills and attitudes, patient's behavior and priorities.<sup>(6)</sup> These factors maybe even more important in the failure of endodontic therapy than directly related endodontic pathogens.

European Society of Endodontology (ESE) published guidelines for undergraduate curricula in 2001, which aimed to standardize the quality and quantity of education and clinical experience received during undergraduate training in dental schools in Europe.<sup>(7)</sup> Although the viewpoint of academic teaching and endodontic societies are clear, little information is available regarding the practice and attitude of dental practitioners towards these standards.<sup>(8)</sup>

Studies have revealed that the majority of dentists do not comply with the formulated guidelines on the quality of endodontic treatment.<sup>(9,10)</sup> Therefore success rates of endodontic treatment performed by endodontic specialists are higher than (> 90%) those performed by general dentists (65–75%).<sup>(11)</sup>

Numerous studies have revealed that endodontic treatment is technically demanding and is carried out under less than optimal conditions in general practice.<sup>(9–13)</sup>

Unfortunately, only a few studies have investigated the practice of dental practitioners towards various aspects of endodontic treatment in developing countries including Sri Lanka.<sup>(14)</sup>

Majority of the studies revealed that most dental practitioners failed to apply new technologies and materials in their daily practice.<sup>(15–19)</sup>

Considering the lack of information describing dental practitioners' attitude towards endodontic standards in Sri Lanka, this study was carried out to assess the current trends in endodontic practice, adaptation to new technologies and attitude of dental practitioners towards endodontic standards in Sri Lanka.

## 2 OBJECTIVES, MATERIALS AND METHODS

Objectives of the study were to describe the current endodontic practices among the dental surgeons in Sri Lanka, and to determine the association between years of practice and choice of endodontic materials and equipment.

A cross-sectional descriptive postal survey was conducted among dental surgeons in Sri Lanka who are members of the Sri Lanka Dental Association (SLDA). The selected group of dental surgeons attached to various institutions including the government sector, university, armed forces and full-time private practice. The survey instrument was a

predesigned, pre-tested self-structured questionnaire.

The questionnaire consisted of two major domains. The first consisted of general information including demographic data of the participants whereas the second part consisted of specific information regarding the current practice of endodontics and attitude towards standard endodontic practice. There were two separate columns allocated for each response to assess the primary and secondary working place respectively.

Informed consent from the participants was taken. A covering letter describing the purpose of the study and necessary information on the study was sent to all the members of SLDA together with a questionnaire and a stamped self-addressed envelope. Nearly 300 questionnaires were returned back due to invalid postal addresses. Voluntary participation and confidentiality of responses were also emphasized. A reminder was posted to all dental surgeons who were selected for the study to maximize the response.

Data entry was carried out using a Microsoft Excel spreadsheet and data was analyzed using SPSS statistical software version 20.

## 3 RESULTS

A total of 393 completed questionnaires were returned out of 1014, giving a total response rate of 38.75%.

Most of the respondents were females (59%) and attached to the government sector (80.4%). Majority of the respondents have BDS as the only academic qualification (63.9%) (Table 1).

**Table 1:** Respondents based on Gender, Workplace and Qualification

Category		Number of respondents	Percentage (%)
Gender	Male	163	41
	Female	230	59
Primary working place	Government	316	80.4
	Full-time PP	19	4.8
	University academic	38	9.7
	Armed forces and police	16	4.1
	Other	4	1
	BDS only	251	63.9
Academic qualification	BDS+ Diploma	77	19.6
	BDS + MSc	14	3.6
	BDS + MD	38	9.7
	BDS + PhD	11	2.8
	Other	2	0.5

Two hundred and twenty (55.5%) of respondents engaged in the private practice (PP) after working hours. Almost all (96.8%) carried out endodontic treatment/root canal therapy (RCT). Respondents who did not practice RCT at the main working place (MWP) did so mainly because it was not

practiced as a routine procedure (48.6%) or not concerned with clinical treatment (38.2%)

Majority of the respondents (60.9% in MWP and 70.1% in PP) completed endodontic treatment within 3 appointments. Only 22.3% of practitioners in the MWP and 28.9% in the PP completed treatment in a single visit.

Use of rubber dam was very low, where only 0.5% in the MWP and none in the PP always used a rubber dam. However, 9.4% of respondents had experience in rubber dam usage. Low rubber dam usage was mainly due to unavailability of material and instruments (Table 2). Rubber dam usage was statistically significant with the year of working experience in the MWP ( $P < 0.05$ ).

**Table 2:** Use of rubber dam and reasons for not using

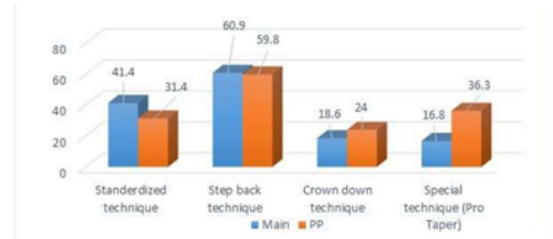
	Main working place		Private practice	
Use of rubber dam	No of respondents	Percentage (%)	No of respondents	Percentage (%)
Always	1	0.5	0	0
Occasionally	21	9.5	19	9.4
Never	184	89.5	197	90.6
Reasons for not using rubber dam				
Patient feels uncomfortable	12	5.5	17	8.3
Difficult in use	16	7.3	29	14.2
Additional time	27	12.3	43	21.1
Extra cost	14	6.4	40	19.6
Not available	183	83.2	140	68.6
Inadequate education	38	17.3	34	16.7
Think it is not necessary	14	6.4	30	14.7

Comparatively, fewer respondents used apex locators as a method of working length (WL) determination. It was interesting to note that still the majority used tactile sensation (MWP — 63.2% and PP- 61.3%) for WL determination. A statistically significant difference was observed with years of experience and the selection of WL measurement methods in the MWP and the PP (Table 3).

The study revealed that more than 80% used K files for root canal preparation. Greater taper files were used by less than 40% and few used endodontic handpieces. Comparatively, more practitioners used NiTi files, greater taper files and endodontic handpieces in the PP than in the MWP. There were statistically significant differences in the usage of K files, NiTi files, greater taper files and endodontic handpieces with years of professional experience in the PP ( $P < 0.05$ ).

More than half of the population instrumented the canals using step-back technique. Pro taper technique was performed by less than 20% in the MWP (16.8%) though a higher percentage used this technique in the PP (36.3%)

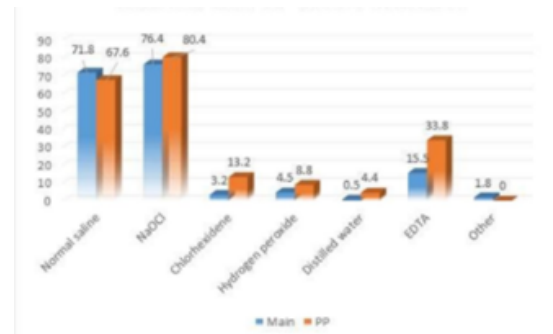
(Figure 1).



**Fig. 1:** Method of root canal instrumentation

Experience since graduation showed a statistically significant influence on some of the root canal preparation techniques in both MWP as well as PP (Standardized technique in the MWP ( $P=0.01$ ) and in PP ( $P=0.008$ ), Step-back technique in the PP ( $P=0.023$ ), Crown down technique in the MWP ( $P=0.037$ )).

Sodium hypochlorite was the most popular irrigant in both MWP (76.4%) and PP (80.4%) followed by normal saline (Figure 2)



**Fig. 2:** Irrigation of root canals

The choice of normal saline ( $P=0.007$ ), chlorhexidine ( $P=0.005$ ) and hydrogen peroxide ( $P=0.000$ ) in the MWP and NaOCl ( $P=0.001$ ) and hydrogen peroxide ( $P=0.026$ ) in the PP was affected by the years of professional experience.

The majority of respondents used intracanal medicaments between appointments in the PP (93.6%) than in the MWP (89.5%). Among them, non-setting water-soluble calcium hydroxide was the most commonly used medicament (MWP- 68.2% PP — 73.5%)

According to this study, there was a significant correlation between years of professional activity and the use of intracanal medicaments ( $P < 0.05$ ).

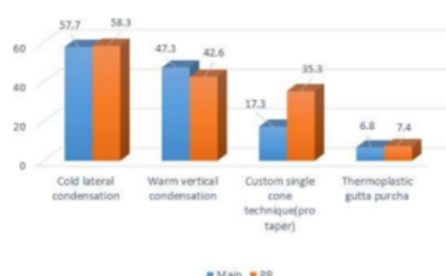
Years of professional activity influenced the choice of some intracanal medicaments such as water based calcium hydroxide in both MWP and PP and CMCP in the PP ( $P < 0.05$ ).

The majority of the respondents preferred cold lateral condensation for obturation. On the other hand, thermoplastic guttapercha was used by a minority of practitioners

**Table 3:** Determination of working length

	Main Working Place						Private practice				
	Known tooth length	Pre operative radiograph	Radiograph with instrument	Tactile sensation	Apex locator		Known tooth length	Pre operative radiograph	Radiograph with instrument	Tactile sensation	Apex locator
<5 years	32	48	27	58	14	<5 years	22	22	24	39	19
6-10 y	06	17	17	17	10	6-10 y	14	26	18	28	13
11-20y	14	37	35	42	20	11-20y	21	42	44	44	22
>20y	12	22	28	22	04	>20y	17	27	25	19	15
P value	0.015	0.555	0.001	0.090	0.069	P value	0.043	0.003	0.243	0.002	0.282

and appeared as 6.8% in the MWP and 7.4% in the PP (Figure 3).

**Fig. 3:** Obturation technique

Years of professional experience affected the preference of cold lateral condensation, warm vertical condensation and use of thermoplastics in the MWP while cold lateral condensation and thermoplastic usage in the PP during root canal obturation (Table 4A & 4B).

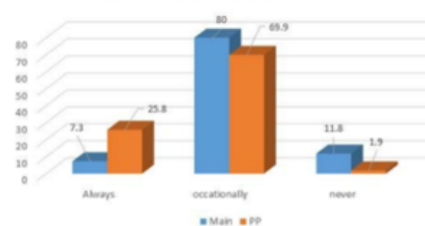
If symptoms such as pain are present, the majority of the respondents (MWP-56.8% PP-55.9%) prescribed antibiotics. Amoxicillin and Metronidazole combination was the most popular antibiotics used by the respondents. On the other hand, 0.5% in the MWP and 1% in the PP never used antibiotics in conjunction with endodontic therapy. There was a correlation between the use of antibiotics with years of professional activity in both MWP and PP. Mandatory use of antibiotics and the use of antibiotics when the symptomatic had a statistically significant correlation with years of professional activity ( $P < 0.05$ ).

Light Cured Composite (LCC) was the most commonly placed core /crown restoration in both MWP (78.6%) and PP (86.7%) followed by Glass Ionomer Cement and Amalgam.

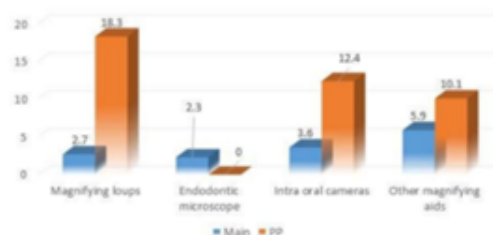
There was a positive correlation between selection of amalgam as a definitive coronal restorative material and years of professional activity in both MWP ( $P = 0.002$ ) and PP ( $P = 0.025$ ).

About 7.3% of respondents in the MWP and 25.5% in the PP recommended crowns for every endodontically treated tooth (Figure 4). Time since graduation had no statistically

significant influence on the recommendation of crowns.

**Fig. 4:** Recommendation of crowns

The preferred method of magnification was loupe (18.3%) in the PP. None of them used endodontic microscopes (Figure 5). However, in the MWP, only 2.7% used magnifying loupes and 2.3% had used an endodontic microscope.

**Fig. 5:** Use of magnifying aids

## 4 DISCUSSION

Survey questionnaires are a common instrument used in evaluating health care systems. In the present survey, the response rate was 38.75%, however low response rates in postal surveys are not uncommon.<sup>(20)</sup> That is the major disadvantage of postal survey. Another problem associated with a questionnaire-based study is the non-respondent bias. With these limitations, the result of the present study revealed the materials, methods and techniques employed by the dental practitioners in Sri Lanka and their attitude towards endodontic standards and adaptation to new

technology.

A study from USA demonstrated a clear inclination to single visit endodontics especially in cases without apical periodontitis.<sup>(21)</sup> Due to lack of experience and clinical skills in performing single visit endodontic treatment, some dentists prefer to treat in multiple visits.<sup>(9)</sup> They may wait until the subsidence of pain and other symptoms before obturating the root canal/s. The present study showed that 70.1% of respondents in the private practice (PP) and 60.9% of respondents in the main working place (MWP) preferred multiple visits over a single visit.

Rubber dam isolation is considered the gold standard in terms of isolation, protection and improves visual access. A study among American dental practitioners revealed that 59% always used a rubber dam while this was less prevalent among European dental practitioners.<sup>(13)</sup> Even though the number of dental surgeons using rubber dam as reported by Markvart et al in 2018 is low in Europe (29%) than in America, there is a significant increasing trend.<sup>(22)</sup> Results of the present study showed that only 0.5% of dental practitioners in the MWP used rubber dam routinely while none of the practitioners in the PP used it regularly which was unacceptably low.

Working length (WL) determination is one of the most critical steps in endodontics, as it facilitates biomechanical preparation and obturation of the root canal system. Around 49% of respondents in the MWP and 53% respondents in the PP assessed the WL using radiograph whereas only 21.8% practitioners in the MWP and 32.8% in the PP used electronic apex locators. It was disappointing to observe that the majority of the respondents relied on tactile sensation for estimation of WL. This reflects the underutilization of technological advances in Sri Lanka. Number of dentists using apex locators in Europe is not only high but also improving with time.<sup>(22)</sup>

The goals of endodontic therapy are to shape and clean the root canal system to receive a three dimensional hermetic filling of the entire root canal space.<sup>(23)</sup> The pro taper file system can be safely used by both inexperienced and experienced practitioners.<sup>(8)</sup> The most popular instrument in root canal preparation among dental practitioners in this study was K files followed by H files. Comparatively more respondents used NiTi files, Pro taper files and Endodontic hand pieces in the PP than in the MWP, indicating that new developments were slowly being incorporated into daily practice.

The step-back technique was the most popular canal preparation technique among respondents. This was similar to the other studies done among Iranian dentists (69.3%)<sup>(8)</sup> and North Jordanian dentists (52.7%).<sup>(24)</sup> Generally, practitioners in Sri Lanka used hand instruments and did not incline to use more advanced engine driven techniques for shaping the root canal system.

Beside mechanical preparation, sodium hypochlorite (NaOCl) has been proven to be the first choice root canal irrigant because of its effective antimicrobial and tissue dissolving action. According to the study done by Malmberg et al in 2019, all the respondents in Sweden and Norway irrigated the root canals with 0.5-1% NaOCl during instrumentation.<sup>(25)</sup> Such opinion was shared by some of the respondents in this study giving the results of 76.4% in the MWP and 80.4% in the PP.

The main objective of the use of intracanal medicaments is to reduce the number of bacteria, to relieve pain, to reduce inflammation and eliminate weeping canals. This study showed that calcium hydroxide medicaments are followed by formocresol which has a tissue fixative property and also distributes to the whole body from the root apex which may potentially induce various harmful effects including allergies. Furthermore, formocresol is a potent carcinogenic agent, there is no indication for these chemicals in modern endodontics.<sup>(26)</sup>

The quality of root canal filling is a major factor that contributes to the overall success of endodontic treatment. Cold lateral compaction of gutta-percha with a root canal sealer is acknowledged universally and is the most common obturation technique.<sup>(27)</sup> It is a relatively simple and versatile technique that does not require expensive equipment. It is, therefore not surprising that it was used by the majority of respondents. Single cone greater taper GP obturation was used by fewer practitioners and constituted 17.3% in the MWP and 35.3% in the PP. Comparatively the least number of respondents used thermoplasticized obturation techniques (Obtura or System B) for root canal obturation. Seemingly, dentists in Sri Lanka were not strong advocates of newer obturation techniques. This may be attributed to the additional cost involved or the lack of skill and training.

Indiscriminate prescription of systemic antibiotics may present more of a risk to the patient than the local infection. The recent review revealed that systemic antibiotic alone offers no additional benefit in the management of acute apical periodontitis and acute abscesses in permanent dentition.<sup>(28)</sup> With increasing antimicrobial resistance worldwide, there is a need to rationalize the prescription of antibiotics. Nearly 40 % of the study population prescribed antibiotics during routine endodontic therapy while only around 1% of the practitioners never prescribed antibiotics. These findings illustrate that dental practitioners overuse systemic antibiotics leading to a high risk of resistance to antibiotics.

According to the European Society of Endodontology (ESE) quality guidelines,<sup>(29)</sup> the tooth should be completely restored to prevent bacterial recontamination of the root canal or fracture of the tooth. A study done in Karachi illustrated that amalgam was the most commonly placed coronal restoration (38%) followed by composite (13.3%) and GIC (14.7%).<sup>(30)</sup> Our results showed that composite was



the most commonly placed restoration in both MWP(78.6%) as well as PP(86.7%), followed by GIC and amalgam.

Some studies showed that root canal treated teeth irrespective of the amount of tooth structure lost either by caries or access cavity preparation, fracture at a much higher rate than teeth restored with full cast crowns.<sup>(31)</sup> The majority of the respondents in this study group occasionally recommended crowns for root canal treated teeth. While the remainders always or never did so. Economic considerations might be the reason why practitioners choose relatively cheaper resin composite restorations instead of crown restorations.

The usage of magnification in endodontics is mainly meant for visual enhancement and improved ergonomics. Despite the lack of evidence supporting the impact of magnification on endodontic treatment outcomes, the benefit of magnification in endodontics is recognized in terms of the predictability in identifying MB2 canals.<sup>(32)</sup> However, more than 80% of the respondents in this study didn't employ any kind of magnification tools. Studies in USA and India suggested the percentage of endodontists using the microscope to be 91% and 56.5% respectively.<sup>(17)</sup> In another study in USA by Savani et al<sup>(33)</sup> only 2% respondents made use of microscope and this difference could be due to difference in the sample population being investigated. None of the respondents in this study used the endodontic microscope in the PP. More practitioners used intraoral cameras in the PP (12.4%) Application of magnification aids for endodontics has to be introduced into the mainstream practice to enhance the success of the endodontic treatment.

## 5 CONCLUSION

Despite newer guidelines and inventions in endodontics, the present survey shows that the usage of technology and protocols related to endodontics among the dental surgeons in Sri Lanka need to be updated. The professional bodies should embark on continuous professional development programs aimed at improving the knowledge and skills of the practitioners. Appropriately structured continuing education programs may be able to encourage and implement the new technologies in their daily practice.

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