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Original Article

A Survey of Standard Protocols for Endodontic Treatment among General Dental Practitioners in Zawia, Libya

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ABSTRACT

***Objectives**. The purpose of this study was to assess the practice of endodontic treatment protocols among general dental practitioners in Zawia city Libya. **Methods**: A questionnaire was distributed randomly to 70 general dental practitioners who were working in public and private dental centers in Zawia Libya. The response rate was 91.4%. The data was collected and statically analyzed. **Results**: The results showed that 100% of the respondents apply pulp test during diagnosis, only 13% of dentists prefer single visit treatment, 36% were using rubber dams for isolation during endodontic treatment. The majority (51%) were using radiographs to determine the working length. In addition, 55% were using rotary instruments and crown down technique (61%) to prepare the root canal. Most respondents used sodium hypochlorite as irrigant (64%), Calcium hydroxide as Intracanal medicament (66%) and single cone as an obturation technique (51%). **Conclusion**. This study provides important data on endodontic treatment by general dental practitioners in Zawia Libya. It shows some general dental practitioners are not following well acknowledged endodontic quality guidelines, a needing of knowledge regarding the importance a new endodontic materials and methods. Continuing education programs to update their knowledge in the field of endodontic are essential.*

***Keywords:** Endodontics, Endodontic Treatment, Treatment Protocols, General Dental Practitioners, Isolation.*

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INTRODUCTION

The primary intent for endodontic treatment is the complete removal of the contamination and prevention of microorganisms from infecting or re-infecting the basis or peri-radicular tissues [1]. This purpose can only be achieved by means of the talent of the dental practitioners, use of precise great substances, and unique endodontic strategies and instruments [2].

The current endodontics involves the creation of many new instruments, materials, and techniques. Controlled studies have proven that root canal treatment brought excessive success rates of more than 90% [3].

Success depends on accurate chemo-mechanical cleaning to get rid of the pulpal particles, dentinal remnants, and microorganisms therefore removing the etiological reasons of endodontic infection. As a result, the basis canal instrumentation continually be supplemented by irrigation to take away the pulpal remnants. Instrumentation becomes useless and remnants

are not well removed owing to insufficient irrigation [4,5].

Unfortunately, the clinical procedures of endodontics are technically challenging because of the complicated root canal systems. These challenges can be listed as identification and enlargement of all canals without procedural mistakes, preserving accurate working lengths, selecting the proper preparation size for effective irrigation and adequate obturation. Multiple new instruments, materials and techniques are being developed in order to overcome those demanding situations [6].

Moreover, the concepts and treatment protocols have been changing with these innovations. The past 10-15 years has altered the manner of endodontic practice. Modern endodontics especially encompasses rubber dam, apex locators and flexible nickel-titanium files with rotary engines. These advances may also provide better treatment results by decreasing procedural errors and increase the comfort for both the dentist and the patient [7,8].

However, General Dental Practitioners (GDPs) perform root canal treatment in many places in Libya owing to the fact that qualified endodontists are either not available or unaffordable to many patients while GDPs are easily accessible to patients. Many studies reported that GDPs do not follow up the endodontic treatment success where success rate was observed between 65% and 75% [9–10].

Various international investigations were carried out to explore the standard of root canal treatment carried out by GDPs. On the other hand, few studies inspect the treatment modalities and quality of standard treatment made by GDPs in Libya. Identifying the important areas where GDPs require further improvement and regular updating remains a challenge. Thus, the purpose of this study was to assess the practice of endodontic treatment protocols among GDPs in Zawia city Libya.

METHODS

A self-administered questionnaire was designed and distributed among GDPs working in Zawia Libya public and private dental centers. It containing information about knowledge and technique according to their daily dental practice.

The prepared questionnaire was randomly distributed among 70 GDPs in Zawia Libya. The questionnaire consisted of 10 questions dealing with technical aspects of endodontic treatments as practiced by the GDPs.

To maintain confidentiality GDPs were instructed not to write their names on the questionnaire form. GDPs were asked to give more details regarding the given questions Information about the standard protocols of root canal treatment were collected.

The collected data was analyzed by using computer software to get the results. Simple descriptive analysis was used to get the results as frequencies and percentages.

RESULTS

Out of the total 64 GDPs responded to the questionnaire giving the response rate 91.4% (64 out of 70). All of the respondents 64 (100%) were GDPs Libyan nationals, i.e., 50 (78.1%) practiced in a private clinic and 14 (21.9%) practiced in a government hospital.

Results are summarized in Table (1), Figure (1), Figure (2) showed of clinically, more than 40% of the respondents were using only hot tests to assess the pulp vitality whereas electric pulp testing was used to assess the pulp vitality by 19% of the respondents.

Approximately, more than half of the respondents 64% were performing endodontic treatment in both single and multiple visits. Only 8% did not take radiographs for diagnosis before starting endodontic treatment. Radiographic evaluation 51% and an electronic apex locater 30% was the most commonly used method for working length determination.

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About 36% of the GDPs were using rubber dams as isolation technique.

The Crown-down technique 61% and the use of rotary instruments 55% were most commonly used to prepare the root canal system. Sodium hypochlorite 64% was the irrigant of choice and Calcium hydroxide 66% was used by most of the GDPs as an intracanal medicament. The majority, 51% of the respondents preferred a single cone as an obturation technique followed by lateral condensation by 44%.

Table 1. Frequency and percentage of responses based on type of practice.

Technique	Frequency (*n*)	Percentage (%)
Vitality of pulp		
Hot test	28	44
Cold test	19	29
Electric pulp test	12	19
Combination of above	5	6
None used	0	0
Visits do you perform endodontic treatment		
Single visit treatment	8	13
Multiple visit treatment	15	23
Both	41	64
Preoperative radiographs		
Conventional	6	9
Digital	53	83
No radiograph	5	8
Isolation technique		
Rubber dam	23	36
Cotton rolls	41	64
others	0	0
Working length determination		
Radiographic technique	33	51
Electronic apex locator	19	30
Tactile sensation	2	3
Combination of methods	10	16
others	0	0
Root canal preparation		
Standardized technique	0	0
Step-back technique	25	39
Crown-down technique	39	61
Instruments used for root canal preparation		
Hand instruments	29	45
Rotary instruments	35	55
Types of root canal irrigants		
Sodium hypochlorite	41	64
Normal saline	12	19
chlorohexidene	6	9
Hydrogen peroxide	5	8
Intracanal medicaments		
Calcium hydroxide	42	66
Formocresol	8	12
Camphorated monochlorophenol	14	22
Obturation technique		
Lateral condensation	28	44
Single cone	33	51
Paste filling	0	0
Vertical compaction	3	5

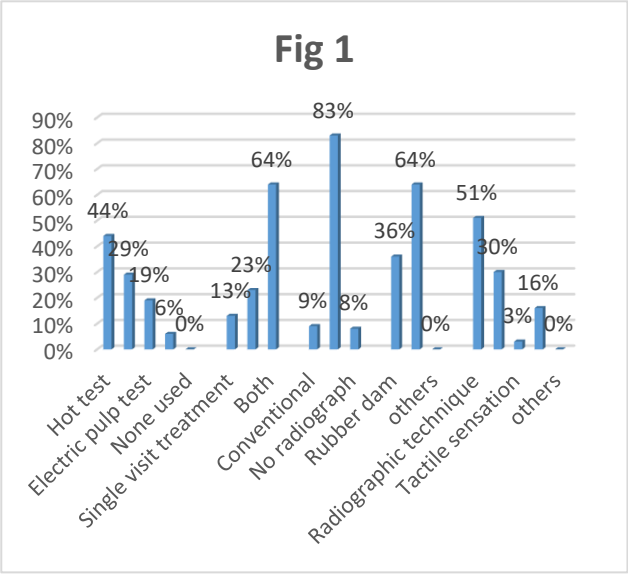

Figure (1): Comparison responses of pulp vitality, visits of treatment, preoperative radiographs, isolation technique and Working length determination.

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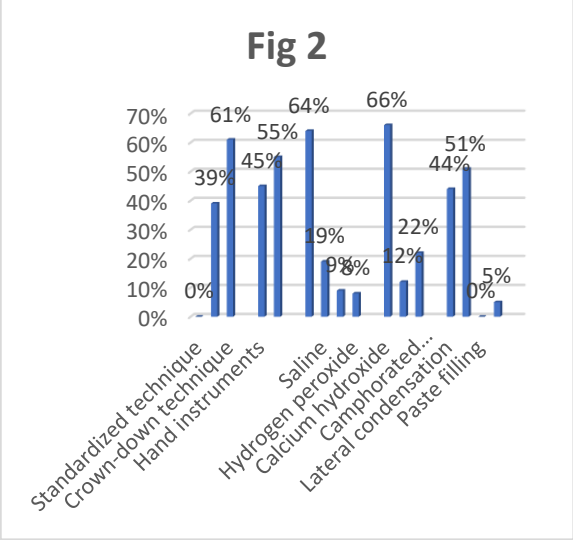

Figure (2): Comparison responses of root canal preparation, Instruments used for root canal preparation, Types of root canal irrigants, Intracanal medicaments and Obturation technique

DISCUSSION

A survey questionnaire is a common method to evaluate healthcare systems, and to overcome the disadvantages of sending the questionnaire by post or email, the questionnaire was distributed to GDPs individually, then collected after finishing them [11].

We investigated the standard protocols for endodontic treatment used by general practitioners working in Zawia Libya dental care centers. The results of this study revealed a gap between the theoretical knowledge of modern endodontics and real practice in in some GDPs working at these centers.

This study of 64 GDPs from different types of dental practices revealed the information regarding the practice of endodontic treatment in Zawia Libya. The response rate is 91.4% in the present study that showed high percentage of general dental practitioners who were performing the endodontic treatment, when compared with surveys performed in some countries like Kenya 63% [12], north of KSA 66% [13], Jordan 72% [14], USA 89% [15] and Benghazi 88.23% [16].

Diagnosis of the tooth to be treated is a vital step for the success of the treatment provided [17]. Methods used to reach diagnosis the results of this study revealed that 100% of the respondents claim that they apply pulp test examination to reach the final diagnosis. This result agreement with Alhejailan et al 2022 [18] but disagreement with Alrahabi et al 2015 [19] whereas result was only 29% using pulp test in practice. This could be to save the time and money during endodontic treatment.

The present study showed that 64% of GDPs were prefer to completing the endodontic treatment in both single and multiple visits according to case, one visit for the teeth with normal periapex and three or more than three visits were doing in the teeth with apical periodontitis or complicated case. This result agreement with Wasilkoff et al 1972 [15] and Iqbal et al 2014 [13], but disagreement with Alhejailan et al 2022 [18] whereas 72% of his participants prefer to practice single visit and 28% prefer to practice multiple visits.

The studies reported in the literature showed that neither single visit endodontic treatment nor multiple visit treatment could be carried out. And neither single visit endodontic treatment nor multiple visit treatment has better outcomes than the other in terms of healing or success rate [20,21].

Preoperative radiographs may be helpful in showing some periapical changes, canal calcification, root curvature, and the number of roots [22]. Only 8% of the respondents start endodontic treatment without preoperative radiograph, most of the respondents (83% Digital and 9% Conventional) in this study always took a preoperative radiograph which is higher than the other previously reported investigations [23,24].

Current results agreement with Manandhar et al 2020 [25] 93.9% and Elrashid et al 2020 [26]

who's reported 28% digital and 53% Conventional of GDPs obtained a pre-operative radiograph. Digital radiograph is faster than conventional radiographs and reduces the X-ray dosage that the patient receives [27].

The results of this study are disagreement with Alrahabi et al 2015 [19] where his results revealed that 48.4% of GDPs took preoperative X-rays and 51.6% did not.

According to European Society of Endodontology using a rubber dam during endodontic treatment is essential and standard of care [28]. However, only 36% of the GDPs in this study used a rubber dam during endodontic treatment. Bubteina et al 2017 [16] reported only 11.3% of GDPs working in dental clinics in Benghazi Libya used rubber dam isolation during endodontic procedure; this percentage was increased to 36% in current study.

The current results agreement with Alrahabi et al 2015 (3%) [19], Al-Fouzan et al 2010 (3%) [29], Hommez et al 2002 (3.4%) [30] and Iqbal et al 2014 (9%) [13]. The reasons for not using rubber dams by GDPs could be justified by the lack of experiences to applying a rubber dam, which it was time-consuming, and some patients refused it as main reasons.

The results of this study is disagreement with Jenkins et al 2001 [31] who showed 55.5% of practitioners used rubber dam during endodontic treatment according to survey performed In the United Kingdom, and with Alhejailan et al 2022 [18] whereas most respondents (96%) use a rubber dam when practicing endodontic treatment.

Different methods are used for working length determination. These include radiographs, electronic, and tactile methods. Traditionally, the most common method for length measurement is radiographs. Electronic apex locators are a modern endodontics innovation and are more accurate in locating the minor apical foramen and measuring the working length than radiographs.[32]

In this survey, most of GDPs (51%) preferred to determine working length with radiographs and (30%) preferred an apex locator to determine the working length accurately. Bubteina et al 2017 [16] reported showed that 41% of the practitioners used digital radiograph, 30.7% conventional dental film radiograph and only 3.3% used electronic apex locators.

In Saudi Arabia Alrahabi et al 2015 (59.7%) [19], Iqbal et al 2014 (9%) [13] reported most of GDPs preferred to determine working length with radiographs, but Alhejailan et al 2022 [18] (92%) and Jouhar et al 2022 [33] showed most of the respondents (79.2%) used an apex locator and confirmed by radiographs to determine working.

The use of tactile sensation to determine working length not recommended because the instrument may bind against the canal wall or may perforate apically. An accurate working length could be achieved by the combination of radiographic technique with modern electronic apex locator.

Cleaning and shaping of the root canal system is important step. The standardized technique is the oldest technique for root canal instrumentation and, to date, some practitioners still use it. In the current study, no one of GDPs used the standardized technique, which could be unfamiliar with it because it was not included in the curriculum during their undergraduate studies.

In this study, 61% of the respondents use the crown down technique for root canal preparation. At the same time, only 39% use the Step-Back technique and the use of rotary instruments 55% and hand instrument 45%.

This results agreement with Küçükkaya et al 2015 [34] who reported 76% used rotary nickel titanium instruments and 52.2 % crown down

technique during endodontic treatment practitioners in Turkey.

According to the results reported by Bubteina et al 2017 [16], Alhejailan et al 2022 [18] and Manandhar et al 2020 [25], hand instruments and step back technique was the most common technique used.

Rotary nickel-titanium files have enabled quicker root canal preparation, lesser canal transportations and greater conservation of tooth structure [35]. However, they cannot solve every clinical situation and the use of hand stainless steel file is inevitable. A crown down technique provides certain advantages such as early organic debris removal, the creation of large reservoir for irrigating solutions a straight access to the apical region of curved canals and greater precision with regard to the exact working length and apical size [36].

The irrigation system is a key part of effective endodontic treatment, it reduces friction between the instrument and dentine, improves the cutting effectiveness of the files, dissolves tissue, cools the file and tooth, and it has a washing effect and an antimicrobial effect to accessory canals. [36]

The present study revealed that most respondents (64%) preferred sodium hypochlorite followed by 19% normal saline. Most studies were reported similar findings like, Alrahabi et al 2015 [19], Bubteina et al 2017 [16], Alhejailan et al 2022 [18] and Jouhar et al 2022 [33]. While in a survey of Whitworth et al 2000 [37] in UK, the local anesthetic solution was the most commonly used irrigant for endodontic treatment. Possibly the limited use of rubber dam was a factor in the choice of root canal irrigant.

Sodium hypochlorite is the main irrigating solution used to break up organic matter and kill microbes effectively; it has high tissue dissolving and disinfecting capability.[18] However, the use of sodium hypochlorite without isolating the field of operation tightly with a rubber dam presents an obviously hazardous practice in the use of potentially irritant irrigation solutions.

The main objective of the use of intracanal medicaments is reduce the number of bacteria, relieve pain, reduce inflammation, and dry the wet canals [38]. In this study, most of the respondents used calcium hydroxide as an intracanal medicament (66%) followed by camphorated monochlorophenol (22%) and Formocresol (12%). Most studies reported using calcium hydroxide as an intracanal medicament as Bubteina et al 2017 [16], Alrahabi et al 2015 [19], Alhejailan et al 2022 [18] and Chan et al 2006 [2].

Iqbal et al 2014 [13], showed that majority of the dentists (55%) were using formocresol as intracanal medicament. Al-Fouzan et al 2010 [29], reported the formocresol was the medicament routinely used by some GDPs in Saudi Arabia. However, formocresol has many adverse effects as mutagenic and carcinogenic agent and should not be used in modern endodontic treatment.[13]

Three-dimensional root canal obturation is a fundamental prerequisite to prevent reinfection of the root canal system [37]. The results of this survey showed that 51% of practitioners in our sample used the Single cone technique to fill the root canal followed by 44% Lateral condensation and 5% Vertical compaction technique. Jouhar et al 2022 [33] reported similar findings.

Lateral condensation remains the most popular technique in root canal obturation and several study reports that as Bubteina et al 2017 [16], Alrahabi et al 2015 [19] and Al-Fouzan et al 2010 [29].

Single cone technique with resin sealer is relatively simple and versatile technique that has produced good results and does not require expensive equipment. Therefore, not surprising that it is the technique used by majority of GDPs in this study.

The present study showed only a very small percentage of GDPs were using modern obturating techniques like injectable obturating technique and thermafil. Apply the newer techniques in the treatment for the prevention of complications, improving the prognosis, reducing the patient discomfort, and improving the patient compliance after the treatment is very important step.

CONCLUSIONS

This study provides important data on endodontic treatment by general dental practitioners in Zawia – Libya public and private dental centers. Most of the GDPs of Zawia performed procedures that often deviated from well acknowledged endodontic quality guideline. However, there is a general lack of knowledge regarding the importance of using rubber dams as well as new endodontic materials to some GDPs. A continuing education program to update their knowledge in the field of endodontics is essential, hands-on courses that could be helped practitioners to adopt the advances in endodontics to their practice.

Conflict of Interest

There are no financial, personal, or professional conflicts of interest to declare.

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