

A Survey of Root Canal Treatment in Saudi Arabia: A pilot study

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Abstract

Objective: To characterize the methods and practices used in root canal treatment in Saudi Arabia.

Method: A questionnaire was developed and distributed in 2010-2011 to a simple random sample of 205 dental practitioners and distributed among private and governmental sectors in 8 different Saudi Arabian cities. The questions were designed to provide understanding of the awareness and knowledge of dentists regarding the new instruments and modern techniques that exist in the practice of endodontics. Completed questionnaires were analyzed in terms of a simple summary statistic.

Results: A total of 85.9% of the practitioners responded. The majority of respondents reported using step-back instrumentation as their main root canal preparation technique (79%) and K-type files as intracanal instruments (75%). Overall, 47% of respondents did not use intracanal medications in their practice. Cold lateral compaction was the method of choice for 86% of respondents. Only 3%, however, used magnification devices and only 20% used electronic apex locators. Among those who indicated using rotary nickel titanium files, 80% use a ProFile system.

Conclusions: In Saudi Arabia, there are traditional trends in practice that do not appear to be supported by scientific evidence. The results of this survey demonstrate the importance of integrating evidence-based practice concepts into teaching curriculums, continuous education courses, and postgraduate studies. However, further studies are necessary to evaluate this trend.

Key words: Dental practice, Endodontics, Root canal treatment

Introduction

The British Endodontic Society [1] has noted that differences in the methods and standards of root canal treatment can result from variations in teaching standards within different dental schools. Other articles have reported that the time and priority given to the teaching of root canals in undergraduate programs has increased and that specialists in root canal treatment will play important roles in the future education of undergraduates [2]. Epidemiological studies suggest that failure rates are higher for teeth treated by non-endodontists than for those treated by endodontists [3,4]. However, very little data are available regarding the general practitioner's approach to endodontic therapy worldwide [5-7].

In Saudi Arabia there are approximately 4260 practicing dentists [8] who have access to continuous education courses offered by universities and the Saudi Dental Society. Approximately 63.6% of them have access to continuous education in the form of lectures and/or hands-on training [9].

The aim of this study was, therefore, to determine the themes (if any) that exist in root canal treatment carried out by general practitioners in Saudi Arabia, to identify deficiencies, and to obtain baseline data to develop postgraduate endodontic courses and continuous education workshops to promote skilled health professionals in the endodontic field.

Materials and Methods

Design of the Questionnaire

This is a pilot cross sectional study. A questionnaire was written and distributed for the first time in 2010 to 205 dentists who performed root canal treatment and are registered with the Saudi Dental Society (SDS). They were selected randomly from 8 different cities (Riyadh, Jeddah, Makkah, Madina, Tabuk, Taif, Jizan, and Dammam) based on help from the SDS and its lists. Inclusion criteria included: 1) Any dentist

or specialist who performed root canal treatment; 2) Dental practice in Saudi Arabia; 3) SDS member; and 4) Electronic email contact. We excluded dentists who did not complete the survey. The questionnaire was anonymous and consisted of 23 questions pertaining to the basic principles and techniques used in modern root canal treatment. The questions were designed to be closed with emphasis on the utilization of new armamentarium such as rotary instruments, Mineral Trioxide Aggregate (MTA), magnification devices, antimicrobial regimens, and management of flare ups, as shown in *Table 1*. Questionnaires were formulated in two languages, English and Arabic. A pilot questionnaire was given to 10 dentists and endodontists to evaluate their comprehension of the survey and the clarity of the questionnaire. Based on the feedback received from the dentists/endodontists, the questionnaire was refined into its final format. The question methodology ensured the questions were not biased or influential toward the participants in terms of encouraging them to select particular answers. For some questions, participants were asked to choose the answer that best fit their clinical situation when a list of possible answers was given, and if they found none of the selections to be suitable, they were permitted to type out an answer of their own.

Selection of more than one answer was allowed for some questions, depending on the targeted idea. An explanation of the study objectives accompanied the questionnaires; the study ensured confidentiality by not including the names or identification numbers of the participants, hence guaranteeing their anonymity.

Distribution and Collection of the Survey

Online questionnaires were distributed using the web interface "Survey Monkey." Participants signed an informed consent form prior to their enrollment in the study. The study was reviewed and approved by the research ethics committee at

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Table 1. Data collected in the questionnaire.

A	Information about the participants	<ul style="list-style-type: none"> - Last academic degree. - Experiences of respondents. - Place of work.
B	Practical points enquired about endodontic practice	<ul style="list-style-type: none"> - The practice of updating medical history. - Main root canal preparation technique. - The use of magnification. - The main intracanal instrument used. - Using rotary NiTi files and the type used. - Irrigation. - Intracanal medication. - Termination of instrumentation relative to the radiographic apex. - Temporary coronal filling materials. - Technique used to determine the working length. - Root canal filling technique. - Root canal sealer. - Duration between root filling a tooth and placing the permanent restoration. - Management perforation during RCT. - Restoration of root filled teeth. - Incidence of additional canals (MB2) in Maxillary 1st and 2nd molars. - Management of flare ups . - Surgical endodontic treatment. - Management of facial cellulites. - Text book used as reference. - Problems in pain control during RCT.

King Abdulaziz University School of Dentistry. To avoid duplication, we asked the participant to fill out a single questionnaire, either by going online or by sending in the paper form. Confidentiality was ensured for all participants by not having them include their names or any related information that could lead to the revealing of their identities.

In order to improve the participants' response rate to the survey, three emails were sent in 2011 to remind them to submit their answers. The completed questionnaires were eventually collected from 176 dental practitioners (85.9%). All of the participants reported having previously performed root canal treatments on patients.

Data Analysis

Completed questionnaires were collected and analyzed in terms of summary statistics, a chi square test or Fisher's exact test. An SPSS package version 19 (SPSS Inc., Chicago, IL, USA) was used for statistical analysis. The p value was considered significant if it was <0.05.

Results

Characterization of respondents

The majority of the participants reported having a bachelor's degree and *General Dentistry* training only (84%) while 16% had advanced dental training in the endodontic field (master's, advanced clinical certificate, or doctorate). Of these, approximately 40% had been in practice for more than 5 years and the remainder for less than five years. Approximately 40% of the participants practiced in the private sector, 48% in the governmental sector, and 12% in the academic sector.

Medical history

Ninety-one percent of respondents reported always updating or taking a medical history prior to root canal treatment, while 8% were concerned about the patient's medical history only if there were signs/symptoms of systemic disease. One percent of respondents took a medical history only if they had time to do so.

Root canal preparation techniques and the utilization of magnification devices

The majority of the respondents (77%) reported using the step back technique and instrumenting root canals with K files (*Figure 1*). Ten percent used NiTi rotary files and 80% used the ProFiles system® (Dentsply, USA) (74%) followed by Hero® (Micro mega, France) (14%), then Protaper (Dentsply Tulsa, Tulsa, OK) (9%), and Quantec (Sybron Dental Specialties, Orange, CA, USA) (3%). Interestingly, only 3% reported using magnification devices during root canal therapy. Endodontic specialists were those who reported using rotary files and magnification devices (p value<0.001).

Antimicrobial regimens

Approximately 70% of respondents irrigated root canals with sodium hypochlorite (NaOCl). The concentrations used ranged between 2.5%-5.25% for 48% of the respondents. The other concentrations used were higher than 5.25% (25%), between 1%-2.4% (20%) and less than 1% (7%). Forty-seven did not prescribe medication between visits, while others used various medications such as calcium hydroxide (CaOH) (26%), camphorated p-monochlorophenol (CMCP) (14%), and formocresol (10%), with the remaining (3%) using cresatin (Metacresylacetate), essential oil, eugenol, or antibiotics. However, we did not ask the practitioners how long the medications were used in the root canal.

Working length determination

Most respondents (73%) used instrumentation between 0.5-1mm short of the radiographic apex when an operator took X-ray photo of the root canal with inserting instrument during root canal preparation. Some ended between 1-1.5mm (19%) or made it flush (8%). Twenty percent used an Electronic Apex Locator (EAL) to determine the working length. The majority of EAL users preferred to keep their instrumentation within 0.5-1mm (97%), compared with 66% of radiographic technique users who preferred the same distance (0.5-1mm) (p value<0.001).

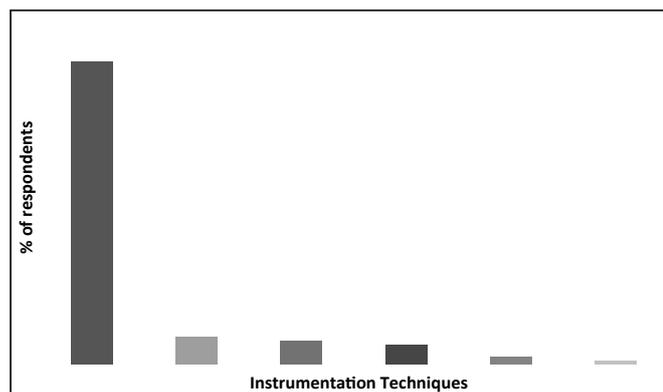


Figure 1. Percentage of root canal preparation techniques used by respondents.

Root canal filling techniques

Eighty-six percent of the respondents used cold lateral compaction, while 14% used other techniques, such as the following: vertical condensation (6%), Thermafill (4%), continuous wave obturation (2%), metal core obturation with silver cone (1%), and Obtura II and Damascus techniques (1%). Sixty-eight percent used an epoxy resin (such as AH26, DeTrey Dentsply, or AH Plus) as a root canal sealer compared with 16% using slow-setting zinc oxide eugenol or CaOH cements (such as Sealapex, Kerr, Romulus, MI, Apexit, Ivoclar, Vivadent, Schaan, or Liechtenstein).

Restoration of root filled treated teeth

Approximately half of the respondents (49%) used cement (IRM®) as the temporary coronal filling material. Other options include reinforced zinc oxide eugenol (12%), cavite® (32%), glass ionomer (4%), and fermin® (3%). Crown restorations were placed by 81% of respondents as follows: 44% of these placed the permanent restoration after 1 week, 22% at the same visit, 19% after 2 weeks, 7% after 1 to 3 days, and 8% after 24 hours or more than 2 weeks.

Incidence of seeing a fourth canal in molars

Presence of a fourth canal in Maxillary 1st and 2nd molars was seen between 30%-50% of the time in 63% of respondents. It rarely appeared for 19% of respondents, appeared between 50%-70% of the time for 16% of the participants, and appeared more than 80% for only 2% of the respondents.

Management of cases of iatrogenic perforation, flare-ups, and abscess

When perforations were encountered, 47% of the respondents referred the case to a specialist. Twenty-six percent used CaOH, 15% used MTA, and 11% extracted the tooth when perforations were encountered. 89% prescribed systemic antibiotics and/or analgesics when flare-ups occurred. As far as managing facial cellulites, 53% of the respondents prescribed systemic antibiotics for 3-5 days then performing the root canal treatment. 44% start root canal treatment first, then, put the patient on an antibiotic course for 3-5 days.

Surgical endodontic treatment

Most of the respondents did not perform endodontic surgeries (84%). The remaining performed one surgery per year (7%), 2-5 surgeries per year (7%) or completed more than 10 surgeries per year (2%).

Textbooks used as reference

The preferred text book for the majority of respondents was Pathways of the Pulp (Cohen S, Burns RC, eds. St.

Louis: Mosby, Inc.) (69% of the respondents). Others used were: Endodontics (Ingle JI, Bakland LK, eds. BC Decker, Hamilton, Ontario) (12%), Endodontic Practice (Grossman LI, Philadelphia: Lea & Febiger) (10%), Endodontic Therapy (Weine FS, St. Louis, CV Mosby Co) (4%), Handbook of Clinical Endodontics (Bence; The CV Mosby Company, St. Louis) (3%), Advanced Endodontics for Clinicians (Daniel J. Bangalore: J & J Publishers) (1%), and Color Atlas and Text of Endodontics (Stock, CJR; Gulabivala, K; Walker, RT; Goodman, JR; Mosby-Wolfe: London) (1%).

Discussion

The specialty of endodontics has witnessed some major developments over the last ten years. The totality of these advances has resulted in more predictable results on the surgical and non-surgical levels. With consideration of these advances, emphasis on teaching tactics will promote some of the major advances that pertain to general practitioners. Ideally, there should be a trend in which dentists take advantage of magnification loops, rotary NiTi file systems, warm obturation techniques, electronic methods for determining root canal length, and appropriate disinfection techniques.

In this report we wanted to establish baseline data regarding the various aspects of root canal treatment as practiced by general dentists in Saudi Arabia. Then, based on these results, we wanted to determine if there are any trends in terms of the practice of various aspects of root canal treatment.

The percentage of the respondents using Nitinol rotary files was 80%. Among the manual techniques, step-back was the most widely used, followed by the step down technique. Preparation techniques involving initial coronal preparation have been proven to result in a better shape and enhanced penetration of irrigant solution [10,11]. There has been accumulating evidence that the super-elastic property of NiTi, coupled with advanced instrument design, promises to allow safe and effective instrumentation of curved and narrow root canals using handpiece-driven instruments operated at low speeds [12].

The realization of the advantages of the use of magnification devices in dental care is on the rise; users are becoming convinced that the use of magnification improves both the quality and speed of treatment. The data reveals that this aspect of modern endodontic practice has been ignored by 97% of the respondents in this study. In addition, 19% of the respondents reported rarely finding 2nd mesiobuccal (MB2) root canals in the mesiobuccal root of the first maxillary molars, while Kulild & Peters [13] found that the incidence of a second mesiobuccal canal was reported in the coronal half of 95.2% of the mesiobuccal roots investigated in the study. Many other investigators have confirmed this finding and reported up to 90% of these roots as having either second canals or major fins leading off the mesiobuccal canal [14-16].

Within the limitations of the questionnaire at hand, it appears that there is a trend toward reasonable anti-microbial techniques in endodontic practice. Sodium hypochlorite NaOCl (0.5-5.25%) was the most commonly employed and is the current irrigating solution of choice. Despite the emergence of newer generations of irrigation solutions,

NaOCl is still considered the gold standard for irrigation [17-19].

Owing to the variability of the point of exit of the root canal in the apical region [20], determination of the working length has always been a challenge [5]. In this survey, 73% of the practitioners used instrumentation levels 0.5-1mm short of the radiographic apex, independent of the pathology. A corresponding number pointed out that they use the radiographic method for determining the exact root canal length. These figures point to the possibility of mistrust in EAL devices, indicating a belief that they do not work effectively. According to Balto [21], however, EALs enjoy high reliability and predictability if they are used properly.

There appears to be a trend toward root canal obturation carried out by cold lateral condensation and epoxy resin sealers. Various reports have concluded that obturation by warm vertical condensation has more advantages than cold lateral condensation does [22,23].

A large majority of Saudi dentists (89%) prescribe antibiotics and/or analgesics to manage flare-up cases, while 11% leave the tooth open. As early as the beginning of 1936, Alfred Walker was the first dentist to advise against the practice of leaving teeth open for drainage. He asserted, "This method is as unscientific as it is antiquated" [24]. Leaving teeth open is the most direct way to facilitate the reinfection of the root canal system in addition to decreasing any possibility of completely eliminating microorganisms within the root canal system. Using intracanal medications between appointments will help disinfect root canals and reduce interappointment pain [11]. These compounds are antibacterial agents under laboratory conditions, but their antimicrobial efficacy and pain prevention/reduction in clinical use is unpredictable [11]. In this study, 47% of respondents did not use any intracanal medication, which may be due to a belief that their effects are weak, or due to insufficient knowledge and updates.

There are several factors that contribute to increasing root canal treatment success in fewer appointments while reducing post-operative signs and symptoms when compared with teeth left open for drainage. These include drainage followed by complete chemo-mechanical preparation, use of an antimicrobial medication inside the canal and as irrigation, and the use of a coronal seal at the same appointment (single visit) [25,26].

The American Dental Association [27] has defined *Evidence-Based Dentistry* as "an approach to oral health care that requires the judicious integration of systematic

assessments of clinically relevant scientific evidence, relating to the patient's oral and medical condition and history, together with the dentist's clinical expertise and the patient's treatment needs and preferences." This approach encourages the use of the latest information rather than a reliance on techniques, materials, and treatments learned years earlier. Relevant to the findings of this survey, implementing the *Evidence-Based Dentistry* approach might prove to be an ideal approach by which to promote the theme of practices that are based on evidence in contrast to those that are not. Additionally, it might be an effective way to teach the process of critical appraisal to those graduates and practitioners who appear to be deficient in its application.

There were a few limitations to our study. The study consisted of a convenience sample of practitioners with email and who responded to our survey. However, this is a pilot study and we hope in the future to design a study with a sample representing the entire country. In addition, we excluded a question about rubber dam use despite the fact that it has a significantly higher success rate in root canal treatment and can be considered a standard of care for nonsurgical root canal therapy [28]. The reason for its exclusion is the fact that we received a low response rate for this question (approximately 24% and 43 subjects). Among these, 35 reported using rubber dams (81%). However, this response may be misleading due to the large number of missing answers.

Conclusion

This report has described endodontic treatment as currently practiced by dentists in Saudi Arabia. It was determined that some practitioners are using outdated techniques and materials with no evidence of clinical effectiveness. However, further studies are required to evaluate the trend.

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