

SURVEY



Attitudes, techniques and trends in endodontic treatment by the house surgeons in dental institutes - Karachi

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Abstract

Background: The attitudes, techniques and different approaches toward endodontic treatment reflects the quality of the root canal treatment (RCT) performed by general dental practitioners. Endodontic therapy has been associated with the pre-operative diagnosis of the tooth, microbial factors, quality of RCT. Environmental factors in which the dentist works may also impact quality of RCT. **Materials and Methods:** The present cross-sectional study was conducted in October 2013 to evaluate the attitudes, techniques and trends in endodontic treatment procedures amongst the house surgeons in dental institutes of Karachi. A cluster sampling technique was employed, and 170 structured questionnaires were distributed to all registered house surgeons employed in six different dental institutes of Karachi. All returned forms were evaluated by a single operator. Descriptive statistics and frequency distribution was analyzed using SPSS version 19. **Results:** From all given questionnaires, 150 filled questionnaires were collected from participants, which is 88.23% response rate. **Conclusion:** It was concluded that the recently graduated dental practitioners lacked expertise in certain regards. They were performing procedures that are deviated from the well acknowledged endodontic quality guidelines.

Keywords: Assessment of radiographs, Endodontic trends, general dental practitioners, root canal treatment

Introduction

The attitudes, techniques and different approaches toward endodontic treatment reflects the quality of the root canal treatment (RCT) performed by general dental practitioners.^[1] Success of endodontic treatment reported in some studies as high as 96% while in others it is as low as 60%.^[2-5] In 2001, the European Society of Endodontology (ESE) published guidelines for undergraduate curriculum that aimed to standardize the quality and quantity of education and clinical experience received during undergraduate training in dental schools in Europe.^[6] Several studies revealed that the majority of general dental practitioners do not follow the formulated guidelines on the quality of RCT.^[7-10] The quality of RCT performed by house surgeons reflects the level of treatment provided to the community as there is a lack of guidance from senior supervisors may not be available.^[11] In Pakistan, only one study was done to assess the technical quality of RCT carried out by house surgeons.^[12]

The purpose of this study was, therefore, to investigate the current trends and attitudes in endodontic treatment by house surgeons of different dental institutes and to compare them to the international academic standards of treatment.

Materials and Methods

The present cross-sectional study was conducted in October 2013 to evaluate the attitudes, techniques and trends in endodontic treatment procedures amongst the house surgeons in dental institutes of Karachi. A cluster sampling technique was employed, and 170 structured questionnaires were distributed to all registered house surgeons employed in six different dental institutes of Karachi. The study was approved by Ethical Committee, Baqai Medical University. Endodontists and general dental practitioners with more than 3 years clinical experience in endodontics were excluded from the study. A total of 150 forms fully filled were returned. The questionnaire included 33 closed-ended questions focused on general aspects of endodontic treatment including the isolation methods, number of appointments, number of radiographs, cleaning and shaping of root canal, material and technique employed in obturation, temporary and permanent restorations, follow-up appointment and prescription of antibiotics. All returned forms were evaluated by a single operator. Descriptive statistics and frequency distribution was analyzed using SPSS version 19.

Results

From all given questionnaires, 150 filled questionnaires were collected from participants, which is 88.23% response rate. All of the respondents are current house officers in different dental institutes.

Number of visits per endodontic treatment: Respondents results are shown in Graph 1. Most of them prefer multiple visits over single visit.

Radiography: Majority of the house officers 72% do not or occasionally bother to tell the radiologist about the technique and only 5.3% inform radiologist about the technique in which to take the radiography.

Pre-operative radiograph: Approximately, 87.3% routinely took pre-operative radiographs before commencing endodontic treatment. About 9.3% did so often, and only 2.7% occasionally did so. 0.7% never took pre-operative radiographs.

Master cone radiograph: However, 59.3% reported taking master cone radiograph while 20% taking no radiograph for determining the master apical cone.

Working length: Graph 2 shows that 50% of the respondents took 1-2 mm working distance short of radiographic apex contrary to 13.3% that took working distance as far as radiographic apex.

Endodontic files: Graph 3 shows that about 93.3% of house officers properly sterilize their endodontic files before treatment while 6.7% often did so. Disposal of the endodontic files after single use was practiced by 18.7% only, and endodontic file was reused after sterilization by 50%.

Instrumentation and obturation technique: Table 1 shows that majority of dentist 60% instrumented the canal using the step-back technique and only 16.7% perform RCT by doing crown-down technique. About 50% never used Gates Glidden burs to aid entrance into the orifice. The majority of dentist 79.3% reported the use of lateral condensation technique for obturation.

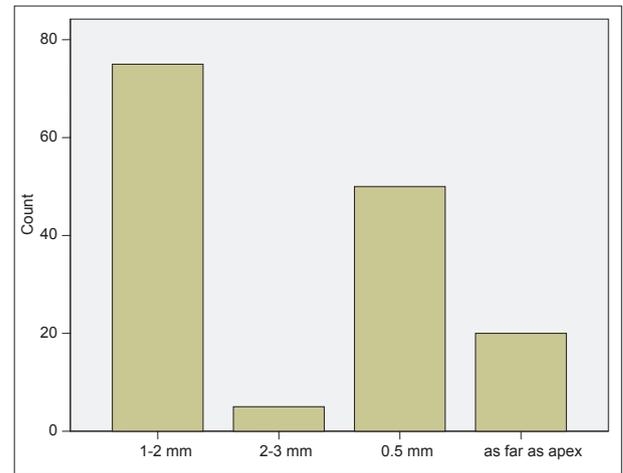
Chair positioning during treatment: About 41.3% respondent often feel comfortable with their chair positioning while performing treatment, and approximately 38% often

found difficulty while treating maxillary teeth and 47% of the respondent never feel difficulty in treating the mandibular teeth.

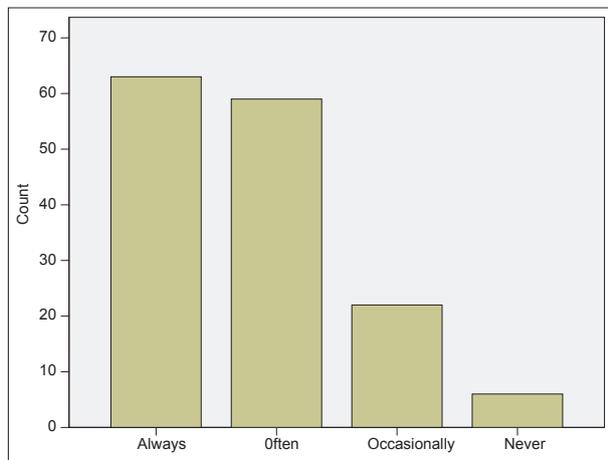
Chamber opening: The number of dentists using round ended access burs for chamber opening are 43.3% while 11.3% never use round bur for opening chamber. However, 29.3% often prefer straight bur for opening chamber and 18.7% never. Almost 50% of the house officers felt that chamber opening is difficult then locating canals.

Table 1: The choice of root canal techniques for shaping of canals

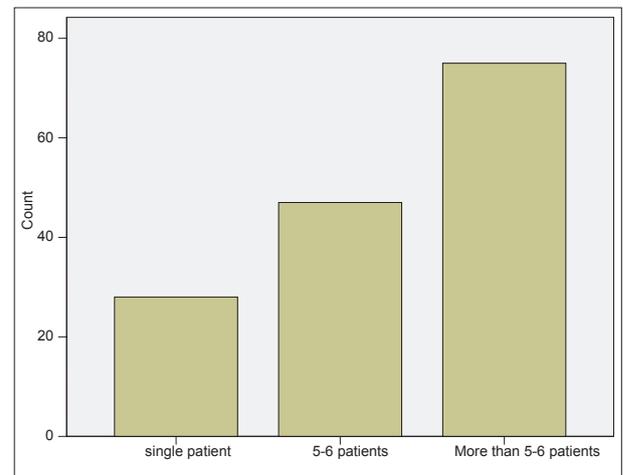
| Canal preparation technique | Crown down technique | Step back technique |
|-----------------------------|----------------------|---------------------|
| Reply options | Frequency (%) | Frequency (%) |
| Always | 25 (16.7) | 90 (60.0) |
| Often | 33 (22.0) | 46 (30.7) |
| Occasionally | 44 (29.3) | 8 (5.3) |
| Never | 48 (32.0) | 6 (4.0) |



Graph 2: What working distance you use from the radiographic apex



Graph 1: Do you prefer multiple visits over single visit?



Graph 3: How many times you use your endodontic files?

Canal irrigation: Over 65.3% of respondents irrigated root canals with sodium hypochlorite. About 34% used saline as primary irrigant. However, 40% occasionally used EDTA as an irrigant just prior to obturation.

Inter-appointment dressing: About 45.3% employed intracanal medicament between visits while 2% never use intercanal dressing.

Faults occurred during shaping and obturation of canals: Table 2 shows that majority of the house officers 47.3% occasionally transports the file while 41% never did so. However, 54.7% occasionally undergone a ledge formation, and 25% did not.

Obturation of 6% of the respondents is always under filled, and 14% never left the canals under filled while obturation of 2% of the house officers always overfilled while 42% never did so.

Complain of pain after initial filling: Respondents were asked to give an estimate of the no. of patients felt pain after initial filling in their second visit and result is shown in Graph 4.

Permanent restoration after RCT: Table 3 shows that 28% of the respondents preferred to wait for 1-week after obturation before placing the permanent coronal filling. While remainders 25.3% place the restoration immediately after completion of the treatment however 32.7% never did so.

Amalgam 38% was the most commonly placed post core endo restoration followed by composite 13.3% and glass ionomer cement (GIC) 14.7% for posterior teeth. About 65.3% of the house officers always recommend crown for every root canal treated tooth. While the remainders often, occasionally or never did so.

Use of systemic antibiotics: Table 4 shows that 68% always prescribe antibiotics in severe infection in conjunction with endodontic therapy while 40% routinely prescribe them.

De-occlusion of tooth: About 40.7% of the respondents always de-occlude the tooth before starting endodontic treatment while 18% never did so.

Recommendation for crown: About 65.3% of the house officers always recommend crown for every root canal treated tooth. While the remainders often, occasionally or never did so.

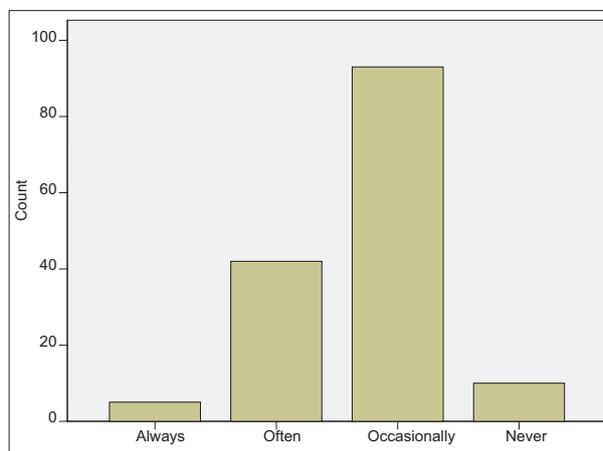
Discussion

The aim of this present study was to assess the attitudes, techniques and trends employed by the house surgeons from different dental institutions in Karachi. The overall response rate was 88.23% in the present study which is higher when compared to different surveys conducted in India

(67%),^[13] Jordan (72%),^[14] Turkey (43%),^[15] but lower when compared to Flemish dentists (99.4%).^[16]

This study is first of its kind that gathered information on attitudes, techniques and trends employed by House surgeons in Pakistan. Recent studies showed that endodontic treatment for single rooted or multi rooted teeth are conventionally done in a single visit.^[13] Majority of the respondents do not practice single visit RCT.^[17] study done in USA^[7] showed inclination to single visit endodontics, especially in cases without periapical periodontitis. Single visit endodontic treatment nowadays have gained more popularity and an increase reliability in the preclinical end odontic teaching in USA and UK.^[18] Due to the lack of experience of clinical skills in performing single visit endodontic treatment, dentists rather prefer to treat in multiple visits.^[10] and may wait till the complete subsidence of pain occurs and other symptoms before obturating the canal. Another possible explanation could be that the initial visit was done for treating the pain and acute symptoms.^[13] The present study result showed that 63 (41.2%) of the respondents preferred multiple visits over single visit.

High-quality radiographs had been recommended for accurate diagnosis and helps in pre-operative assessment of potentially difficult cases,^[19] but still, only about 81% of the surveyed general dental practitioners routinely perform pre-operative radiographs.^[13] The present study showed that 131 (85.6%) of the respondents preferred taking pre-operative radiographs.



Graph 4: How likely is that after your filing the patient complains of pain at its second visit?

Table 2: Procedural accidents occurred during shaping and obturation of canals

| Procedural accidents | File transportation | Ledge formation | Obturation underfilled | Obturation overfilled |
|----------------------|---------------------|-----------------|------------------------|-----------------------|
| Reply options | Frequency (%) | Frequency (%) | Frequency (%) | Frequency (%) |
| Always | 6 (4.0) | 1 (0.7) | 9 (6.0) | 3 (2.0) |
| Often | 11 (7.3) | 29 (19.3) | 45 (30.0) | 17 (11.3) |
| Occasionally | 71 (47.3) | 82 (54.7) | 75 (50.0) | 67 (44.7) |
| Never | 62 (41.3) | 38 (25.3) | 21 (14.0) | 63 (42.0) |

Table 3: Type of post core endo restoration use for posterior teeth

| Post core endo restoration | Composite | Amalgam | GIC |
|----------------------------|---------------|---------------|---------------|
| Reply options | Frequency (%) | Frequency (%) | Frequency (%) |
| Always | 20 (13.3) | 57 (38.0) | 22 (14.7) |
| Often | 44 (29.3) | 40 (26.7) | 25 (16.7) |
| Occasionally | 41 (27.3) | 27 (18.0) | 34 (22.7) |
| Never | 45 (30.0) | 26 (17.3) | 69 (46.0) |

GIC: Glass ionomer cement

Table 4: Behavior regarding prescription of antibiotics

| Prescription of antibiotics | Routinely prescribed | Prescribed only in severe cases |
|-----------------------------|----------------------|---------------------------------|
| Reply options | Frequency (%) | Frequency (%) |
| Always | 60 (40.0) | 102 (68.0) |
| Often | 49 (32.0) | 27 (18.0) |
| Occasionally | 35 (23.0) | 12 (8.0) |
| Never | 6 (4.0) | 9 (6.0) |

Working length determination is one of the most important step in RCT as it facilitates cleaning, shaping and obturation of the root canal.^[20] Inaccurate determination of working length of the root canal often results in apical perforation, overextension of irrigants or obturation materials into the periradicular tissues may also lead to incomplete instrumentation and obturation.^[13] The present study results showed that 50% of the respondents obtained working length radiographically keeping 1-2 mm distance short of the radiographic apex. The optimal working length in teeth with vital pulp appears to be 1-2 mm from the radiographic apex.^[21]

A survey done in 2008 showed that 80% of the general dental practitioners prepared canals 0.5-1 mm short of the radiographic apex.^[22] Whitten *et al.*^[7] reported that 75% of the respondents stated that they would instrument 0.5 mm short of the radiographic apex. In Flemish survey, 38.9% of the general dental practitioners prepared canals 1 mm short of the radiographic apex, independent of the pathology.^[10] The quality of the mechanical preparation of the root canal system is another critical step which influences the outcome of endodontic treatment.^[23] Results of the present study showed that about 93.3% of respondents properly sterilize their endodontic files before treatment while 6.7% often did so. Mensudar *et al.*^[24] in a survey showed that only 16% of the respondents used glass bead sterilizer for endodontic files. About 80% of the respondents disposed their endodontic files after they see signs of distortion and 20% disposed their files when it becomes blunt, but none of them disposed endodontic files after single use. The present study showed that Disposal of the endodontic files after single use was practiced by 18.7% only, and endodontic file was reused after sterilization by 50%.

Mehta *et al.*^[13] in a survey showed that only 2% of the respondents disposed files after a single use, 33% reused

endodontic files after autoclaving, 27% after cold sterilization and 39% after glass bead sterilization.

The most common technique employed in the present study was step back technique. About 60% of the respondents prepared the canal by doing step back technique, and only 16.7% of the respondents prepared the canal using crown-down technique. About 50% never used Gates Glidden burs to aid entrance into the canal orifice. In another survey, majority of the general dental practitioners (59.66%) instrumented the canal using the step-back technique followed by crown down technique (23.66%).^[13]

It is well documented that the root canal systems are complexed, and no instrumentation or methods for cleaning and shaping are available which can entirely flush out the tissue remnants or debris smeared on the canal walls.^[25] Thus, an antimicrobial irrigant is required to kill the bacteria by chemical means.^[9] In the present study, 65.3% of respondents irrigated root canals with sodium hypochlorite, while 34% used saline as primary irrigant. However, 40% occasionally used EDTA as an irrigant before obturation. Kaptan *et al.*^[15] in a survey showed that 90.2% of the respondents used sodium hypochlorite followed by EDTA (44.1%) and hydrogen peroxide (38.4%). Al-Omari in a survey showed that 14.5% of the respondents used sodium hypochlorite followed by 21.4% hydrogen peroxide.^[14] The same results were shown amongst dentists in Switzerland^[26]

Calcium hydroxide is considered to be the standard intracanal medicament for inter-appointment dressing.^[27] In a survey done by Al-Omari, only 11.5% of the respondents used calcium hydroxide followed by 4.6% formaldehyde.^[14] The present study results showed that about 45.3% employed intracanal medicaments between visits while 2% never used intracanal dressings. Formaldehyde- containing products have been used for their antimicrobial and fixative properties, as they are toxic to periradicular tissues^[28] and may have mutagenic and carcinogenic properties.^[29] The use of calcium hydroxide, as intracanal medication, should be encouraged among general dental practitioners in developing countries as it is effective against most root canal pathogens.^[30,31] Kaptan *et al.*^[15] in his survey showed that 61.5% of the respondents used calcium hydroxide which is comparable to the 69.7% in Flanders^[16] and 63% in North Jordan^[14] and more than 9% in USA^[7] and 7%^[9] in UK.

It has been well documented that highly skilled operators are less likely to perform accidental mishaps that may ultimately compromise the prognosis.^[32] About 47.3% of respondents occasionally transport the file while 41% never did so. However, 54.7% occasionally undergone a ledge formation and 25% did not. A study done by Jawwad *et al.*^[33] showed that 45 (90%) of house surgeons did not transport the file while only 5 (10%) transport the file.

Root canal obturation prevents the entry of microorganisms into already cleaned root canal. Lateral condensation is the most common obturation technique that has produced good results, and it does not require expensive equipment.^[18,34] A similar study conducted in Saudi Arabia showed that 63.5% of the general dental practitioners used lateral condensation technique.^[35]

The present study results showed that 79.3% of respondents performed obturation with lateral condensation technique. Underfilled obturations were done by 6% of the respondents and 2% of the respondents showed overfilled obturations.

The respondents were asked to indicate how long they would wait before commencing final restoration of endodontically treated tooth. A study done in South Africa showed that 41% immediately restored the tooth after completion of RCT, 38% preferred waiting for 1-week, 47% preferred 2-6 weeks delaying final restoration, 4% preferred 2 months and 11% preferred to wait for 3-6 months.^[36] The present study results showed that 28% of the respondents preferred to wait for 1-week after obturation before placing the permanent coronal filling. While remainders 25.3% place the restoration immediately after completion of the treatment however 32.7% never did so.

According to the ESE quality guidelines for endodontics,^[1] the tooth should be completely restored to prevent bacterial recontamination of the root canal or fracture of the tooth. A study done in 2012 showed that 79.8% of the respondents restored teeth using resin composite as the material of choice. Crown restoration was favored by almost half of the respondents (49.5%) followed by amalgam filling (25.8%).^[37] The present study results showed that Amalgam was the most commonly placed restoration 38%, followed by composite 13.3% and GIC 14.7%. 65.3% of the respondents always recommended crown for every root canal treated tooth. While the remainders often, occasionally or never did so. Economic considerations might be the reason most of the practitioners choose relatively cheaper resin composite restorations instead of crown or inlay/onlay restorations.

Systemic antibiotics are prescribed only if there has been systemic spread of infection. Otherwise, they may present more of a risk to the patient than the local infection. There is evidence that antibiotics are prescribed appropriately in general dental practices.^[38] Recent review reveals that systematic antibiotic alone offer no additional benefit in the management of acute apical periodontitis and acute abscesses in a permanent dentition.^[39] With the increasing worldwide problem of antimicrobial resistance, there is a need to rationalize prescription of antibiotics.^[13] The present study results showed that 68% always prescribe antibiotics in severe infection in conjunction with endodontic therapy while 40% routinely prescribe them.

Conclusion

It was concluded that the recently graduated dental practitioners lacked expertise in certain regards. They were performing procedures that are deviated from the well acknowledged endodontic quality guidelines. House surgeons did not seem to keep up with recently introduced techniques but used more conventional methods. They worked in under less than optimal conditions. Unfortunately, it was noted that some of the house surgeons did not even bother to tell the radiologist about the direction in which to take the radiograph. Most of them felt difficulty in chair positioning and considered chamber opening a challenging procedure. Majority of them performed obturations that were underfilled and most commonly a ledge formation.

Clearly better training of the house surgeons as well as economic resources is necessary to obtain an improvement in the technical quality of the RCT and therefore, hopefully, decrease the frequency of apical periodontitis in root filled teeth.

This survey shows the importance of establishing higher training programs and continuing dental education in their 1-year house job period. There is a need to promulgate the latest concepts and practices of endodontics.

References

1. European Society of Endodontology. Quality guidelines for endodontic treatment: Consensus report of the European Society of Endodontology. *Int Endod J* 2006;39:921-30.
2. Friedman S. Treatment outcome and prognosis of endodontic therapy. In: Orstavik D, Pitt Ford TR, editors. *Essential Endodontology*. Oxford: Blackwell Science; 1998. p. 36-7401.
3. Marques MD, Moreira B, Eriksen HM. Prevalence of apical periodontitis and results of endodontic treatment in an adult, Portuguese population. *Int Endod J* 1998;31:161-5.
4. De Moor RJ, Hommez GM, De Boever JG, Delmé KI, Martens GE. Periapical health related to the quality of root canal treatment in a Belgian population. *Int Endod J* 2000;33:113-20.
5. Eriksen HM, Kirkevang LL, Petersson K. Endodontic epidemiology and treatment outcome: general considerations. *Endod Top* 2002;2:1-9.
6. European Society of Endodontology. Undergraduate curriculum guidelines for endodontology. *Int Endod J* 2001;34:574-80.
7. Whitten BH, Gardiner DL, Jeansonne BG, Lemon RR. Current trends in endodontic treatment: Report of a national survey. *J Am Dent Assoc* 1996;127:1333-41.
8. Weiger R, Hitzler S, Hermle G, Löst C. Periapical status, quality of root canal fillings and estimated endodontic treatment needs in an urban German population. *Endod Dent Traumatol* 1997;13:69-74.
9. Jenkins SM, Hayes SJ, Dummer PM. A study of endodontic treatment carried out in dental practice within the UK. *Int Endod J* 2001;34:16-22.
10. Slaus G, Bottenberg P. A survey of endodontic practice amongst Flemish dentists. *Int Endod J* 2002;35:759-67.
11. Ahmed A, Khattak O, Ali H, Maqbool A, Azhar G, Shamim A, *et al.* Radiographic technical quality of root canal fillings performed by house surgeons in the Islamic international dental college: A pilot study. *Pak Oral Dent J* 2008;28:271-4.
12. Muhammad NS, Hina ZR. Radiographic assessment of quality of root canal treatment. *Pak Oral Dent J* 2010;30:491-4.
13. Mehta N, Raisingani D, Gupta S, Sharma M. Endodontic trends: Where we are and where we should be-A survey report. *People's J Sci Res* 2013;6:30-7.
14. Al-Omari WM. Survey of attitudes, materials and methods employed in endodontic treatment by general dental practitioners in North Jordan. *BMC Oral Health* 2004;4:1.
15. Kaptan RF, Haznedaroglu F, Kayahan MB, Basturk FB. An investigation of current endodontic practice in Turkey. *Sci World J* 2012;2012:1-6.
16. Hommez GM, Moor BM. Root canal treatment performed by Flemish dentists. Part 1- cleaning and shaping. *Int Endod J* 2002;35:1-8.
17. Tronstad L, Asbjørnsen K, Døving L, Pedersen I, Eriksen HM.

- Influence of coronal restorations on the periapical health of endodontically treated teeth. *Endod Dent Traumatol* 2000;16:218-21.
18. Qualtrough AJ, Whitworth JM, Dummer PM. Preclinical endodontology: An international comparison. *Int Endod J* 1999;32:406-14.
 19. Consensus report of the European Society of Endodontology on quality guidelines for endodontic treatment. *Int Endod J* 1994;27:115-24.
 20. Weine FS. Calculation of working length. In: *Endodontic Therapy*. 5th ed. St. Louis: Mosby; 1996. p. 395-422.
 21. Kerekes K, Tronstad L. Long-term results of endodontic treatment performed with a standardized technique. *J Endod* 1979;5:83-90.
 22. Ravanshad S, Sahraei S, Khayat A. Survey of Endodontic Practice amongst Iranian Dentists Participating Restorative Dentistry Congress in Shiraz, November 2007. *Iran Endod J* 2008;2:135-42.
 23. Peciuliene V, Rimkuvienė J, Aleksejuniene J, Haapasalo M, Drukteinis S, Maneliene R. Technical aspects of endodontic treatment procedures among Lithuanian general dental practitioners. *Stomatologija* 2010;12:42-50.
 24. Mensudar R, Julius A, Sukumaran G. Evaluation of current trends in endodontic treatment procedure among the dental practitioners. *Indian J Multidiscip Dent* 2011;1:311-4.
 25. Kirkevang LL, Horsted-Bindslev P. Technical aspects of treatment in relation to treatment outcome. *Endod Top* 2002;2:89-102.
 26. Barbakow F. The status of root canal therapy in Switzerland in 1993. *J Dent Assoc S Afr* 1996;51:819-22.
 27. Chong BS, Pitt Ford TR. The role of intracanal medication in root canal treatment. *Int Endod J* 1992;25:97-106.
 28. Gulabivala K. Intracanal medication and temporary seal. In: *Color Atlas and Text of Endodontics*. 2nd ed. London: Mosby-Wolfe; 1995. p. 145-50.
 29. Spangberg I. Intracanal medication. In: Malvern PA, editor *Endodontics*. 4th ed. USA: Williams and Wilkins; 1994. p. 627-40.
 30. Bystrom A, Claesson R, Sundqvist G. The antibacterial effect of camphorated paramonochlorophenol, camphorated phenol and calcium hydroxide in the treatment of infected root canals. *Endod Dent Traumatol* 1985;1:170-5.
 31. Sjögren U, Figdor D, Spångberg L, Sundqvist G. The antimicrobial effect of calcium hydroxide as a short-term intracanal dressing. *Int Endod J* 1991;24:119-25.
 32. Bierenkrant DE, Parashos P, Messer HH. The technical quality of nonsurgical root canal treatment performed by a selected cohort of Australian endodontists. *Int Endod J* 2008;41:561-70.
 33. Jawwad IA, Aliya E, Aaqil M. Comparison of root canal treatment quality performed by house surgeons and postgraduate students. *Pak Oral Dent J* 2014;34:543-7.
 34. Walton RE, Johnson WT. Obturation. In: Walton RE, Torabinejad M, editors. *Principles and Practice of Endodontics*. 3rd ed. Philadelphia, PA, USA: W. B. Saunders ; 2002. p. 239-67.
 35. Iqbal A, Akbar I, Qureshi B, Sghaireen MG, Al-Omiri MK. A Survey of Standard Protocols for Endodontic Treatment in North of KSA. *ISRN Dent* 2014;2014:865780.
 36. Lushen MN. A survey of attitudes, materials and techniques used in endodontic treatment by South African Dentists. M.Sc. Thesis. School of Oral Health Science, University of the Witwatersrand, Johannesburg; 2006.
 37. Ahmed MF, Elseed AI, Ibrahim YE. Root canal treatment in general practice in Sudan. *Int Endod J* 2000;33:316-9.
 38. Palmer NA, Pealing R, Ireland RS, Martin MV. A study of prophylactic antibiotic prescribing in National Health Service general dental practice in England. *Br Dent J* 2000;189:43-6.
 39. Matthews DC, Sutherland S, Basrani B. Emergency management of acute apical abscesses in the permanent dentition: A systematic review of the literature. *J Can Dent Assoc* 2003;69:660.