

DIFFICULTIES CONCERNING ENDODONTIC NON-SURGICAL ROOT CANAL TREATMENT STEPS IN KINGDOM OF SAUDI ARABIA

Ayman O. Mandorah¹, Mohammed A. Aljohani², Ghaida'a A. Moria³, Moayad F. Sheayria², Mohammed F Alsulami²,
Khames T. Alzahrani^{4*}

¹ Restorative and Dental Materials Department, Faculty of Dentistry, Taif University P.O Box 11099 Taif 21944, Saudi Arabia.

² Restorative and Dental Materials Department, Intern, AlFarabi dental college, Jeddah, Saudi Arabia.

³ Restorative and Dental Materials Department, Intern, King Abdulaziz University, Jeddah, Saudi Arabia.

⁴ Restorative and Dental Materials Department, BDS, PGD Endo, Ministry of Health, Saudi Arabia.

ABSTRACT

Introduction: Root canal treatment (RCT) is a procedure that is made through phases even more scrupulous yet one of the most challenging procedures. Even more formidable for undergraduate students who are in dental practice. Therefore, a questionnaire is conducted to determine significant procedural difficulties and challenges encountered by undergraduates during endodontic root canal treatment.

Methods: This was an observational cross-sectional study based on web-survey questionnaires developed by the authors with high confidence. The sample size was 409 estimated using the Qualtrics calculator with a confidence level of 95% and a margin of error of 5%. The questionnaire is divided into sections, evaluating the difficulties they're facing during the treatment starting from diagnosis to obturation. Data were collected using Google forms and prepared for analysis using Microsoft Excel. Statistical analysis was performed using the SPSS software.

Results: A total of 409 participants responded, (57.9%) of undergraduates and interns had difficulties during the access cavity step. And (61.9%) of participants had difficulties to locate the canal orifice, while most of the participants did not report any issues; in particular, in the cleaning and shaping step (86.3%) and in performing local anesthesia (85.1%).

Conclusion: In conclusion, we identify and understand difficulties during root canal treatment, the majority of participants had difficulties to locate the canal orifice, and during the access cavity.

Key words: Root Canal Treatment, Endodontic Difficulties, Cleaning and Shaping.

Introduction

Root canal treatment (RCT) is a procedure that is made through phases even more scrupulous yet one of the most challenging procedures.¹ And the key goals of root canal treatment (RCT) are to eliminate bacterial irritants from the root canal system, properly clean and shape, and then fill the system to avoid possible reinfection of the sealed canal system. Also, the appropriate healing of the periapical area is closely related to the efficient RCT that was made.² Every clinician should be well aware of the results of root canal therapy.³ The errors may occur at any treatment phase, So the result of RCT depends on the clinician's ability to carry out the procedure without failures as possible.⁴ measure the effectiveness of root canal treatment, clinical signs and symptoms should not always be counted upon. In root canal treated teeth, epidemiological studies show a high incidence of apical periodontitis, although most cases remain asymptomatic⁵⁻⁸. It is also important to include radiographic requirements as well.⁹ In line with what was said during these phases, the student could go through many obstacles

and difficulties which is certainly different from a student to another. Therefore, It's an important part of the development of teaching methodologies is the insights of dental undergraduates on their educational experiences.¹⁰

Root canal therapy is considered one of the most critical tasks a dentist should be undertaking during his career. To achieves this the European Society of Endodontology (ESE) has proposed that 20 root canal treatments (RCTs) in 20 teeth, including extracted teeth, be performed before graduation in the recommendations for the undergraduate program.¹¹ The feedback from undergraduates is relevant for developing the program and learning process.¹² The endodontic procedure has greatly improved in all respects in the last few years while dentists can successfully perform root canal therapy in more than 94% of cases.¹³ The goal of root canal therapy is to diagnose and treat the pulp and periapical diseases and to establish sufficient treatment.¹⁴ The outcomes of these treatments depend on the clinician's ability to conduct the procedure without any mistakes.¹⁵ Moreover, nonsurgical root canal therapy (RCT) is a

significant component of integrated dental healthcare. Previous studies recorded success rates of > 90 percent under controlled conditions for non-surgical RCT. Nonetheless, in cases where RCT is conducted by general practitioners, this high success rate has been recorded to fall to 40–65%.¹⁶ Also, several studies indicated that the adequacy of RCT conducted by undergraduate students ranged from 33% to 70%. Assessing the consistency of the care and the level of clinical errors will help to enhance training programs and strengthen health services.¹⁷ Hence, under a managed situation, the success rate of primary canal teeth care free of apical periodontitis is 90 to 95%.¹⁸ Nevertheless, apical periodontitis typically occurs in 24.5–65.8% of all treatments done by general dentists.¹⁹

Many students say that during their practice they do not feel sufficiently prepared to conduct such treatments. It is especially true for molar root canal therapy, due to the anatomical complexity and root canal difficulty.²⁰

Over the years, there has been extensive study of the technical quality of root fillings performed by undergraduate students; however, results often seem disappointing.

Many endodontic applications present alternative treatment methods, such as advanced retreatment methods (surgical or non-surgical).²¹ The educational system is a complete system that starts from the source of receiving the information, where the doctor is the provider and the student is the recipient. Developing this process requires knowledge of the main problem. So, we’re doing this study to determine significant procedural difficulties and challenges encountered by undergraduates during endodontic root canal treatment. However, when looking at the previous researches we found a few numbers of samples of the same idea but nothing similar has been found in Saudi Arabia. Our secondary objective is to assess dental undergraduates’ perceptions about the difficulties they are facing while performing root canal treatment in Saudi Arabia and then inspect the student’s and interns’ responses to the difficulties and make a dissertation to the educators about possible resolutions. This research was approved by the institutional review board at AlFarabi dental college in Jeddah, Saudi Arabia, (reference: IRB-20-08/8).

Materials and Methods

This is a cross-sectional survey study will be conducted on (July – August 2020) in Saudi Arabia. The sample size will be estimated using the Qualtrics calculator with a confidence level of 95%; a sample size of 409. A standardized

questionnaire will be distributed in Saudi Arabia. The Inclusion criteria are undergraduate students and interns, Male and Female, who have finished the pre-clinical endodontic course and agree to participate. These students had previously attended and finished the preclinical endodontics course and had entered the clinical endodontic program. Students who did not complete the pre-clinical course in endodontics were excluded from the study. A Structured questionnaire will be used as a study tool. This tool was developed after reviewing related studies carried out in Saudi Arabia and elsewhere.

The survey instrument will be a self-administered anonymous questionnaire in English. Distributed among 5th, 6th- year dental students and dental interns. The questionnaire consists of 18 questions, classified into 3 sections containing questions regarding root canal treatment (RCT) difficulties. Starting with introductory questions, diagnosis, tooth type, isolation, anesthesia, access cavity, working length, and reaching through cleaning and shaping and obturation. We will collect the information by distributing an online survey among Universities in Saudi Arabia. The data collected by computer using the “Microsoft Office Excel Software” program (2019) for windows. Will then be transferred to the Statistical Package of Social Science Software (SPSS) program, version 20 (IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp). This research was approved by the institutional review board at AlFarabi dental college in Jeddah, Saudi Arabia, (reference: IRB-20-08/8).

Results

A total of 409 undergraduates who had completed all endodontic courses over the same period were given the survey. Approximately 57.9% of undergraduates mentioned that they had some difficulties during the access cavity step. About 61.9% of the undergraduates had difficulties to locate the canal orifice. On the other side, for example, there was a decreasing

Characteristics	Yes (%)	No (%)
Do you face any difficulties during Endodontics diagnosis?	167 (40.8%)	242 (59.2%)
Do you face any difficulties in performing local anesthesia?	601(14.9%)	348 (85.1%)
If it fails do you know another anesthetic technique?	261 (63.8%)	148 (36.2%)
Do you face any difficulties during taking a periapical x-ray?	92 (22.5%)	317 (77.5%)
Is there any difficulty when you use a rubber dam?	69 (16.9%)	340 (83.1%)

Do you face any difficulties during the access cavity step?	237 (57.9%)	172 (42.1%)
Is it difficult to perform deroofing for the pulp chamber?	135 (33.0%)	274 (66.9%)
Do you face any difficulties to locate the canal orifice?	253 (61.9%)	156 (38.1%)
Do you face any difficulty during determine the working length?	110 (26.9%)	299 (73.1%)
Is there any difficulty in the crown-down technique?	84 (20.5%)	325 (79.5%)
Is there any difficulty in the cleaning and shaping step?	55 (13.4%)	354 (86.3%)
Do you have sufficient knowledge about intracanal medication?	232 (56.7%)	177 (43.3%)
Do you know how to apply intracanal medication?	174 (42.5%)	235 (57.5%)
Do you have any difficulties to achieve a slight resistance (tug-back) during master cone fitting?	143 (35.0%)	266 (65%)
Do you face any difficulties during root canal obturation?	92 (22.5%)	317 (77.5%)

Table 1: Students' Responses for Question Three to Seventeen of Perceived Difficulties

percentage (65%) of those experiencing problems associated with difficulties to achieve a tug-back during master cone fitting. The results for sufficient knowledge about intracanal medication Demonstrated that 56.7% of the dentistry students and interns reported difficulty Most of the participants did not report any issues; in particular, in the cleaning and shaping step (86.3%) and in performing local anesthesia (85.1%). [See table 1]

Items			P
	Yes (%)	No (%)	
Facing any difficulty during the working length determination			0.000
Yes (%)	52 (12.7%)	40 (9.7%)	
No (%)	58 (14.1%)	258 (63.0%)	
Having face any difficulties to achieve a slight resistance (tug-back) during master cone fitting			0.011
Yes (%)	42 (10.2%)	50 (12.2%)	
No (%)	101 (24.6%)	215 (52.2%)	

Table 2: Correlation Between Answers Regarding Difficulty when taking Periapical X-Ray, Working Length and Slight Resistance

Also, a relationship between the difficulties when taking the periapical x-ray, difficulty when determining working length, and difficulties to achieve a tug-back during master cone fitting parameters were found: the Participants who

faced difficulties when determining working length also had difficulty in taking a periapical x-ray (12.7%) which is the significance (P = 0.000). On the other side, there is a close relationship between participants who had difficulty achieving a tug-back during master cone fitting and taking periapical radiograph was found (10.2%) (P = 0.011) [See Table 2].

Items	Yes (%)	No (%)	P
Having to face any difficulties during access cavity step			0.538
Yes (%)	147 (35.9%)	106 (25.9%)	
No (%)	90 (22.0%)	65 (15.8%)	
Having face difficult to perform deroofing for pulp chamber?			0.000
Yes (%)	112 (27.3%)	141 (34.4%)	
No (%)	23 (5.6%)	132 (32.2%)	

Table 3: Correlation Between Answers Regarding Difficulty to Locate the Canal Office, Access Cavity Step and Perform Derroofing For Pulp Chamber

Were showed a correlation between participants who having difficultuies during access cavity and facing difficulties to locate canal orifice ; participants who claimed to have difficulty during the access cavity step also mentioned that they had trouble in locating root canals (35.9%) which is not significant but not statistically important (P = 0.538). Likewise, the difficulties to perform deroofing for pulp chamber and difficulties to locate the canal orifice parameters, Respondents who had problems getting included in the removing the pulp chamber roof also had difficulty in identifying root canals (27.3%) which is a statistical significance (P = 0.000). [see Table 3]

Subscale	Frequency	Percentage
At which of the following steps do you face the MOST difficulty		
Endodontic diagnosis	47	11.5%
Rubber dam isolation	12	2.9%
Access cavity	171	41.8%
Deroofing and find the orifice	88	21.5%
Determine working length	53	13.0%
Cleaning and shaping	17	4.2%
Obturation	21	5.1%

Table 4: Students' Responses for Question One and Two of Perceived Difficulties

The results showed that the most difficult endodontic treatment step among all participants was the access cavity (41.8%) followed by Deroofing and find the orifice (21.5%). [See Table 4]

Characteristics	Frequency	Percentage
GPA		
Less than 2	2	0.5%
2-2.49	7	1.7%
2.5-3.99	169	41.3%
4-4.49	151	36.9%
4.5-5	80	19.5%

Table 5: Sociodemographic Characteristics of the Study Participants (n = 409)

Characteristics	Yes	No	P
GPA			
Less than 2	2 (0.48%)	0 (0.0%)	0.000
2-2.49	0 (0.0%)	5 (1.2%)	
2.5-3.99	84 (20.5%)	85 (20.7%)	
4-4.49	81 (19.8%)	70 (17.1%)	
4.5-5	64 (15.6%)	16 (3.9%)	

Table 6: Percentage and Frequency of GPA And Sufficient Knowledge About Intracanal Medication.

The GPA average among all 409 participants was 2.5-3.99 (41.3%) followed by 4-4.49 (36.9%). [See table 5].

Also, there was a positive association between the GPA and sufficient knowledge about intracanal medication parameters. Participants who had a GPA of 2.5-3.99 (41.3%) almost half of them didn't have sufficient knowledge about intracanal medication 85 (20.7%). On the other side participants who had a GPA of 4-4.49 (36.9%) have sufficient knowledge about intracanal medication 81(19.8%).[See table 6]

Discussion

The treatment of root canal is a very complicated procedure and needs confidence. Previous studies found that dental undergraduates have a lack of confidence in root canal treatments.²² One complication during the process might impact the procedure negatively.²³ General practitioners noted that in a dental school it is hard for the undergraduate to have much exposure to a sufficient amount of root canal treatment which led to the rise of the relatively low professional standards of root canal treatment.²⁴ The purpose of this study was to explore the difficulties that undergraduate dental students encounter during root canal therapy from beginning to the end. Exploring the difficulties that the students may face during the root canal treatment might help us find a way to encourage, improve, and facilitate the treatment process for the students and the patients. Our study showed that the main issue faced by dental students is finding and locating root canals. Similar to Kaplan et al., 2020²³ study as it is a very important step to

open a clear, visible endodontic access cavity to prevent any missing canals. And also evaluation through radiograph is the most common method for evaluating the quality of root canal treatment, and in our study, we worked to find out the percentage of those facing difficulties in radiographic evaluation, which is one of the most important steps in the process of endodontic treatment.¹⁴ On the other hand, Endodontic diagnosis is a very critical step because the treatment plan solely depends on it. And some students get confused during the final diagnosis. Therefore, we found that students who suffer from difficulty are slightly less than students who think it is uncomplicated. The majority of students do not face any difficulties during local anesthesia likewise Tavares et al., 2019¹⁰ study and many other studies. And also, most of the students can figure different anesthetic techniques if there were a failure in the first place. Also, ensuring a clean field during the procedure is a prime factor for the success of root canal treatment. The use of the rubber dam during the treatment of the root canal provides three key advantages: cross-infection prevention, safety, and improvement of treatment performance.²⁴ In Ibrahim et al., 2012²⁴ study stated that the easiest and simplest steps in the root canal treatment for the student were placing the rubber dam with a percentage of (92%) almost similar to ours which is (83.1%) in the Kingdom of Saudi Arabia. With the developments of tools in the treatment of root canal, the use of rotary devices has become more frequent instead of the traditional methods. And through our study, we can see that students approved that using Apex locator to determine an accurate working length and also using rotary systems to accomplish adequate cleaning and shaping is much easier, faster and more sufficient for them than the conventional ways comparing to Kaplan et al., 2020²³ study which stated otherwise. The technique of Crown-Down was simple and durable for all the undergraduate students in this study equivalent to Tavares et al., 2019 study¹⁰. Though, viewing the results of students achieving a slight resistance in master cone fitting we found that almost third of the student actually face a difficulty achieving that resistance or tug back. The treatment of the root canal is a long process and for a clinically less experienced dental student, it will take much longer in time. And as Obturation is the last step of the whole process and course one of the most extremely important steps of them all for a successful treatment, The stress and the length of this procedure can also overwhelm both the patient and the undergraduate student. The undergraduate student should be allowed to have exposure to further cases to surpass this difficulty. Kaplan et al., 2020²³ study found that the student finds a difficulty in doing obturation by (54.7%) while in ours only a small percentage (22.5%) of the students in Saudi Arabia suffer during obturation.

Additionally, throughout our study, we further noticed that the percentage of students who have sufficient knowledge about intracanal medicaments is slightly higher than students who have less knowledge. But the percentage of students who know how to apply the intracanal medicament is slightly lower than the ones who don't know how to apply the medication in Saudi Arabia. Unlike the students in both the studies Kaplan *et al.*, 2020²³ and Tavares *et al.*, 2019¹⁰ were their students have more skills on how to apply the intracanal medication inside the canals. Moreover, frequent feedback obtained from undergraduates is very beneficial and should be used to evaluate and resolve the point of concern.

Conclusion:

Our study was conducted to determine significant procedural difficulties and challenges encountered by undergraduates during endodontic root canal treatment. In conclusion, when we determine and knowing the difficulty during root canal treatment it was a locate the canal orifice. The greatest beneficiary is the patient to get the best treatment result.

Acknowledgment

Taif university researchers supporting Project number (TURSP-2020/256) Taif University, Taif, Saudi Arabia.

Conflicts of Interest

The authors have no conflicts of interest to declare.

Source of Funding

This study did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Ethical Approval

This research was approved by the Institutional Review Board at AlFarabi dental college in Jeddah, Saudi Arabia, KSA (reference: IRB-20-08/8).

References

1. Alsulaimani RS, Al-Manei K, Baras B, Alaqeely R, El Metwally A, Ashri N. Students' perception of multiple dental visits for root canal treatment: Questionnaire-based study. *Saudi Endod J.* 2016 Jan 1;6(1):21–5.
2. Alsulaimani RS, Al-Manei KK, Alsubait SA, AlAqeely RS, Al-Shehri SAM, Al-Madi EM. Effects of clinical training and case difficulty on the radiographic quality of root canal fillings performed by dental students in Saudi Arabia. *Iran Endod J.* 2015 Sep 1;10(4):268–73.
3. Difficulties in performing root canal treatment among undergraduates of dental colleges in south india. Available from: <http://dx.doi.org/10.24327/ijcar.2017.3168.0213> volume 6; issue 4; april 2017; page no.3166-3168
4. Hendi SS, Karkehabadi H, Eskandarloo A. Iatrogenic errors during root canal instrumentation performed by dental students. *Iran Endod J.* 2018 Dec 1;13(1):126–31.
5. Jahanimoghdam F, Gisour E. F, Askari R, & Rad, M. (2018). Attitude Regarding Dental Stem Cells among Dental Practitioners in Kerman, Iran. *Arch. Pharm. Pract.* 2018;9(3):10-3.
6. Alamri AM, Alshammery HM, Almughamis MA, Alissa AS, Almadhi WH, Alsharif AM, Sroji DT, Alqarni MA. Dental Recession Aetiology, Classification and Management. *Arch. Pharm. Pract.* 2019;10(2):28-31.
7. Bulgakova AI, Vasilyeva NA, Vasilyev EA. The clinical and immunological rationale for the use of prolonged action dental ointment in periodontology. *J. Adv. Pharm. Educ. Res.* 2019;9(4):65-69.
8. Kharalampos M, Put VA, Tarasenko SV, Reshetov IV. Comprehensive patient rehabilitation while performing immediate dental implant placement with the use of information-wave therapy (literature overview). *J. Adv. Pharm. Educ. Res.* 2020;10(2):1-6.
9. Akbar I, Alam F, Raza M. Radiographic technical quality of root canal fillings performed by undergraduate dental students. Vol. 37 No. 2 (2017): April-June 2017, *Pakistan Oral & Dental Journal.*
10. Tavares LG, Lima SMF, Lima MG, Arruda MP, Menegazzi TC, Rezende TMB. Undergraduate dentistry students' perception of difficulties regarding endodontic treatment. *Aust Endod J.* 2019 Apr 1;45(1):98–105.
11. Awooda EM, Mudathir MS, Mahmoud SA. Confidence level in performing endodontic treatment among final year undergraduate dental students from the University of Medical Science and Technology, Sudan (2014). *Saudi Endod J.* 2016 Jan 1;6(1):26–30.
12. Alrahabi M. The confidence of undergraduate dental students in Saudi Arabia in performing endodontic treatment. *Eur J Dent.* 2017;11(1):17–21.
13. Abdulrab S. Endodontic procedural errors by students in two Saudi dental schools. *Eur Endod J.*; 17 April 2018 DOI 10.14744/ej.2018.29491
14. AlRahabi MK. Evaluation of complications of root canal treatment performed by undergraduate dental students. *Libyan J Med.* Vol. 12 No. 1 (2017) DOI: 10.1080/19932820.2017.1345582

15. Çiçek E, Özsezer-Demiryürek E, Özerol-Keskin NB, Murat N. Comparison of treatment choices among endodontists, postgraduate students, undergraduate students, and general dentists for endodontically treated teeth. *Int Dent J.* 2016 Aug 1;66(4):201–7.
16. Ayhan T. The self-confidence levels of senior dental students during endodontic treatment procedures. *Turkish Endod J.* 2016;1(1):19–22.
17. Puryer J, Amin S, Turner M. Undergraduate Confidence When Undertaking Root Canal Treatment and Their Perception of the Quality of Their Endodontic Education. *Dent J.* 2016 Dec 26;5(1):1.
18. Eskandarloo A, Karkehabadi H, Zeinab S, Hashemi H, Ahmadi M, Sareh Hendi S, et al. Radiographic Quality of Root Canal Obturation Performed By Fifth Year Students of Hamadan Dental School. *IEJ Iran Endod J.* 2017;12(2):236–41.
19. Al-Sudani DI, Basudan SO. Students' perceptions of pre-clinical endodontic training with artificial teeth compared to extracted human teeth. *Eur J Dent Educ.* 2017 Nov 1;21(4):e72–5.
20. Mirza, M. B. (2015). Difficulties Encountered during transition from preclinical to clinical endodontics among Salman bin Abdul Aziz University Dental Students. *Journal of international oral health: JIOH,* 7(Suppl 1), 22.
21. Çiçek E, Özsezer-Demiryürek E, Özerol-Keskin NB, Murat N. Comparison of treatment choices among endodontists, postgraduate students, undergraduate students, and general dentists for endodontically treated teeth. *Int Dent J.* 2016 Aug 1;66(4):201–7.
22. Puryer J, Amin S, Turner M. Undergraduate Confidence When Undertaking Root Canal Treatment and Their Perception of the Quality of Their Endodontic Education. *Dent J.* 2016 Dec 26;5(1):1.
23. Kaplan T, Sezgin G, Sönmez-Kaplan S. Dental students' perception of difficulties concerning root canal therapy: A survey study. Vol. 10, Issue 1 *Saudi Endodontic Journal.* Wolters Kluwer Medknow Publications; 2020. p. 33–8. <https://hdl.handle.net/20.500.12445/1181>.
24. Ibrahim AA, Fadlalla NB, Nory NF, Abu-Bakr NH. Difficulties in performing root canal treatment among dental students in Sudan. *Indian J Dent.* 2012 Oct;3(4):196–200.

Corresponding Author

Khames Torki Alzahrani

Restorative and Dental Materials Department, BDS, PGD Endo, Ministry of Health, Saudi Arabia.

Email: dr.khames.alzahrani @ gmail.com