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Original Research Article

# Student's confidence level in performing root canal treatment and its correlation with encountered errors

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ABSTRACT

**Objectives:** This study aims to investigate the confidence level of undergraduate final-year dental students in performing root canal treatment (RCT) and the relationship to the problems encountered during RCT.
**Materials and Methods:** A validated online questionnaire was distributed to final-year dental students at Universiti Teknologi MARA. The questionnaire utilized both scaled responses and closed-ended questions to gain data regarding students' confidence levels in performing root canal treatment.
**Results**: In this study, 93.4% of the students were confident in placing a rubber dam, 90.8% were confident in injecting local anesthesia and root canal irrigation. Procedures that were rated as least confident were access cavities and management of interappointment flare-ups. For the mean rate of self-confidence in performing RCT in the dentition, maxillary anterior teeth (4.24±0.63) ranked highest followed by mandibular premolars (4.11±0.72), whereas the least confidence was in treating maxillary molars (3.38±0.69). Higher scores of self-confidence were in the management of necrotic pulp (4.22±0.65), followed by vital pulp treatments (3.95±0.61). The main mishaps that students encountered were canal blockage (57.9%) and underestimation of length (52.6%). There is no statistically significant correlation between the confidence level and encountered errors. .
**Conclusions**: The mean overall confidence score of different endodontic procedures was high, which is 80%. Examining the confidence level of students is a crucial part of this study, which can help to enhance the quality of endodontic education in areas that need improvement.



## 1. Introduction

A recent study reported that the overall frequency of acceptable technical quality of root fillings performed by undergraduate students, assessed radiographically, was low (48.75%) and decreased significantly as tooth position moved posteriorly.[1] The most common errors reported in root canal treatment (RCT) performed by undergraduate students were ledges, furcation perforations, apical transportations and apical perforations.[1] Endodontic treatment is considered one of the most technically difficult and stressful disciplines within the field of dentistry because of the anatomical diversity of the root canal system, which requires adequate knowledge from the operator.[2]

Endodontic treatments aim to preserve a tooth or to maintain part of the dental pulp healthy. When the dental pulp is infected or damaged, treatment aims to eliminate the infection and ensure the healing of the periradicular tissues.[3] Generally in RCT, the damaged pulp is removed, cleaned and disinfected, and then filled three-dimensionally.

The incidence and demand of RCT in patients and awareness regarding saving their teeth as opposed to

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extraction are expected to increase further.[4] Ideally, a dental officer should have acquired the necessary knowledge upon graduating so that they are able to diagnose endodontic cases correctly, develop a definitive treatment plan and carry out an adequate RCT.[5,6] Ng et al. in 2007[7] concluded in their study that the success rate of RCT lies between 68% to 85% where, during recall visits with a minimum of 6 months after treatment, there is complete resolution of periapical lesion. Clinically, successful endodontic treatment was described as the absence of symptoms (swelling, pain, tenderness to percussion and the sinus tract) and radiographically, as a reduction in the dimension of the periapical lesion or no change in size.[8]

One of the most important factors that influence productivity is confidence. Person, leadership, and team confidence are all important for success, and a lack of confidence has been linked to failure.[9] The operators need to be confident that they should have 'the feeling or belief that they have faith in their own abilities.[10] It is essential to assess the operator's level of confidence prior to treating a patient and work on enhancing their competency.

In general, there is limited information regarding the way students perceive endodontics and their level of self-confidence about various aspects of endodontic treatment with respect to their future practice.[11] From the studies that we reviewed which have almost similar topics to our study[10–14] about 60.0% of the study concluded that their students have a high level of confidence in performing root canal treatment, 20% displayed neutral and the other 20% showed low confidence level. However, all of the studies were conducted outside of Malaysia, which was in England, Sudan, Saudi Arabia and Yemen. To date, there is no similar study done in Malaysia that assesses the confidence level of RCT in undergraduate dental students. Therefore, the objectives of this study were to collect data from final-year undergraduate dental students regarding their confidence level in performing RCT and to investigate the correlation between the confidence level and problems encountered during the treatment.

## 2. Materials and Methods

### 2.1. Study design

This cross-sectional study was conducted in the Faculty of Dentistry, UiTM, Selangor, Malaysia**.** Ethical approval was obtained from the Research Ethics Committee, UiTM, Malaysia (REF: 600-TNCPI(5/1/6)). The participants of this study were final-year undergraduate dental students of the Faculty of Dentistry, UiTM, Malaysia.

### 2.2. Sample size

The sample size of the study was 76 people out of 86 total final year students. The sample size is calculated using Epi-Info Software (CDC, Atlanta, Georgia, USA) using a 95% of confidence level and 5% of confidence limit. This study includes undergraduate students, year 5 students in semester 2.2 with experience of at least three root canal treatments of the anterior tooth and well versed in English language. We excluded postgraduate students, year 1 to year 4 students and year 5 students with experience of 2 root canal treatments and below.

### 2.3. Questionnaire

The questionnaire was adopted from Madfa and Senan's study in 2019.[10] A pilot study was conducted with the participation of ten Year Four students in order to validate the questionnaire. Some modifications were made which were then verified by endodontists with a Content Validity Index (CVI) of 0.82 that indicate it is suitable to be used. The questionnaire utilized both scaled response and closed-ended questions to gain data and understanding regarding student perception in performing root canal treatment. This questionnaire consists of four parts. Part A consists of demographic details questions, Part B contains 5-point Likert scale system scoring ranging from 1 to 5. These scores ranged from very little confidence to very confident. While Part C was regarding the practical and clinical experience of root canal treatment and part D was made up of closed-ended questions with yes or no answers about the errors encountered during the root canal treatment and its frequencies.

### 2.4. Data analysis

The data were analyzed using Statistical Package of Social Science (SPSS) version 27 for Windows (SPSS Inc., Chicago, IL, USA) to obtain the percentage, mean and standard deviation for each of the components in the questionnaire to compare within each group. The descriptive statistics portion of the obtained data was presented in the form of tables and figures using the Microsoft Excel version 2206 program. Pearson's correlation was used to determine the statistical significance between the student's confidence level and the number of encountered errors. The significant level was set at 0.05.

## 3. Result

In this study out of 76 students, 84% were female and 16% were male with a mean age of 24-year-old. Figure 1 showed levels of students' confidence in performing various endodontic procedures. Students displayed high confidence in performing endodontic treatments as the mean total confidence score of different endodontic procedures is 80%. The procedure in which students showed the highest level of confidence was the placement of a rubber dam isolation for which 93.4% of them scored as very confident, followed by administering local anesthesia and root canal irrigation (90.8%) (Figure 1). In performing endodontic procedures,

only 1.3% reported a level of very little confidence in access cavities and management of interappointment flare-ups.

When rating the self-confidence for performing RCT of different teeth on the dental arch, maxillary anterior teeth (4.24±0.63) followed by mandibular premolars (4.11±0.72) are the teeth where the students felt the most confidence treating whereas they were less confident in treating maxillary molars (3.38±0.69).

Higher scores of self-confidence were reported in the management of different endodontic indications which include the management of necrotic pulp (4.22±0.65), followed by vital pulp treatments (3.95±0.61). According to the experience of RCT, the mean experience in preclinical anterior and posterior teeth are 2.61±1.10 and 2.46±1.14 respectively. While in clinical experiences they experience 2.01±1.38 in anterior teeth and 1.84±1.28 on posterior teeth which are slightly lower when compared to the preclinical experience.

Based on the questionnaire distributed, the highest mishap encountered during the clinical session by the students was canal blockage (Figure 2) which is 57.9%. The second most encountered error is the underestimation of length with a score of 52.6%. The percentage showed that more than half of the respondents have encountered these mishaps. In contrast, treating the wrong tooth and tissue emphysema was the least error encountered by the student with only 2.6%.

There was no significant correlation between confidence level in performing root canal procedures and mishaps encountered during RCT among final year dental students ($p>0.05$). The observed correlation coefficient was 0.13 which suggests a positive relationship and little or no correlation. The data were tabulated in Table 1.

## 4. Discussion

Numerous studies have been conducted to assess the quality and outcome of endodontic treatments performed by dental students; however, little is known about their level of confidence in different aspects of endodontic treatment in relation to their future practice. Therefore, this research was conducted to obtain information about the confidence of final-year undergraduate students at the Faculty of Dentistry, UiTM regarding endodontics management.

This study revealed that rubber dam placement scored the highest confidence among the students which coincides with other studies.[12–14] There was some research, on the other hand, that found that students were less confident in the placement of rubber dams because the students only started working with rubber dams in their final year due to the unavailability of the rubber dam.[10,15] The second highest confidence level was administering local anesthesia where a similar result was found in other studies.[12,13]

Access cavity preparation procedure scored the lowest confidence rate among the students in performing various endodontic procedures. Access cavity is difficult to perform as it requires precision and angulation. The operator must be familiar with the standard location of the pulp chamber in each tooth as the shape of a pulp chamber varies depending on the size of the tooth itself. Therefore, more attention is required to the theoretical and practical teaching of this subject. A study by Davey et al.[12] found that students have a low level of confidence when performing endodontic access cavity preparation, which is similar to our results. Another procedure with low confidence levels among the students was the management of interappointment flare-ups. Flare-ups are a complex and poorly understood condition with a variety of etiological hypotheses.[16] Mechanical, chemical, or microbial damage to the pulp or periradicular tissues, resulting in acute periradicular inflammation, is among the causes of this flare-up.[16] Three studies found similar findings, describing low students' confidence in flare-up management as a result of students' failure to communicate with patients to manage this complication.[11,12,17] This occurs often because students lack experience and tactile skills, as well as those of an experienced dentist, to minimize or avoid over-instrumentation or extrusion of irrigants and intracanal debris into the periradicular tissues.[10]

The students felt most comfortable treating maxillary anterior teeth. This is due to their location which makes the teeth more accessible to be treated when compared to maxillary molars.[13] Similar results were reported.[11,12,17] While, maxillary molar teeth were found to be the most difficult teeth to treat which was consistent with the findings of other researchers.[15,17,18] This is an anticipated outcome since molar endodontic treatment is a difficult procedure in which students have the least confidence.[15] RCT of upper molars is complicated due to their location which makes the inability to see directly and complex anatomy such as the presence of mesio buccal two canal.[17] As stated by Ng et al. in 2010,[19] maxillary first molar teeth have the lowest survival rate because of failure to locate the mesiobuccal two canals.

Regarding the management of different endodontic indications, the students' confidence was highest in managing necrotic pulp which is similar to a study conducted by Madfa and Senan.[10] The students have high confidence in managing necrotic pulp because it is the most common clinical diagnosis in RCT patients. The second highest confidence score by the students was the management of vital pulp treatments which is similar to a study done by Tanalp et al. in 2013.[17]

The most encountered mishap during clinical sessions was canal blockage and underestimation of length. Canal blockage can be interpreted as blockage of the canal during the preparation phase by dentine or tissue debris in a previously patent canal that results in a shorter working length thus preventing access and complete disinfection of the desired working length of the tooth.[20] It frequently

**Table 1:** Pearson's correlation between confidence level in performing various endodontic procedures

| Variables | Mean | SD | Pearson's Correlation Coefficient, r | |
|---|---|---|---|---|
| | | | Percentage Part B I | Total Score Part D |
| Percentage Part B I | 80.81 | 9.45 | 1 | 0.13 |
| Total Score Part D | 4.17 | 3.20 | 0.13 | 1 |

occurs in canals prepared with a stepback technique with anti-curvature and circumferential filing.[21] Another same study[10] also reported that canal blockage was the main mishap occurring accompanied by ledge formation. While Tanalp et al.[17] reported perforation as the most adverse occurrence students experienced in the clinic. Other reported[22] frequent iatrogenic errors by senior dental students in RCT procedures include void and overfilling. Underestimation of working length was another common mishap encountered by the students which may cause incomplete instrumentation of the canal.

While for the least encountered error, we found that treating the wrong tooth and tissue emphysema have the same prevalence. Drying the root canal system with air under pressure using a three-way syringe might be the most probable contributing cause of tissue emphysema.[23] Therefore, precautionary steps need to be taken to avoid the complication although the occurrence is rare.

The result of this study showed that there is no significant correlation between confidence levels in performing root canal procedures and mishaps encountered during RCT among final-year dental students which were similar to the finding by Awooda et al.[11] Despite that, Awooda et al.[11] also found that there is no association between overall confidence level and the number of performed RCTs as opposed to Murray and Chandler.[6] Even though their clinical session was cut to almost 5 months during the pandemic period, the students still scored high in the confidence level. This might be due to the more practice of RCT on extracted teeth to complete the MCE and also the experience that they gained when assisting their partner in the clinics as four-handed dentistry is practiced.

## 5. Conclusion

In conclusion, our final-year undergraduates show high mean confidence of 80% in performing various root canal procedures. The self-evaluation of acquired skills and confidence levels by students is a useful tool for a realistic assessment of the dental curriculum, which will eventually help identify and overcome barriers. There was no correlation between the confidence level and problems encountered during RCT as each case treated is unique and different from each other where confidence level might also be affected by the experience of the operator.

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None.

## 7. Conflict of Interest

None.

## References

1. Ribeiro DM, Réus JC, Felippe WT, Pacheco-Pereira C, Dutra KL, Santos JN, et al. Technical quality of root canal treatment performed by undergraduate students using hand instrumentation: a meta-analysis. *Int Endod J*. 2018;51(3):269–83.
2. Rolland S, Hobson R, Hanwell S. Clinical competency exercises: some student perceptions. *Eur J Dent Educ*. 2007;11(3):184–191.
3. Quality guidelines for endodontic treatment: consensus report of the European Society of Endodontology. *Int Endod J*. 2006;39(12):921–30.
4. Qamar R, Noor N, Khan Q, Jalees M, Manzoor MA, Abbasi S. Evaluation of house officers confidence level in performing endodontic treatment. *Pakistan Oral Dent J*. 2018;38(2):268–73.
5. Mathew ST. Evaluation of dental student's perception and self confidence levels regarding endodontic treatment. *Int J Dent Health Sci*. 2015;2(4):712–21.
6. Murray CM, Chandler NP. Undergraduate endodontic teaching in New Zealand: Students' experience, perceptions and self-confidence levels. *Aust Endod J*. 2014;40(3):116–22.
7. Ng YL, Mann V, Rahbaran S, Lewsey J, Gulabivala K. Outcome of primary root canal treatment: systematic review of the literature-part 1. Effects of study characteristics on probability of success. *Int Endod J*. 2007;40(12):921–39.
8. Yousuf W, Khan M, Shiekh A. Success rate of overfilled root canal treatment. *J Ayub Med Coll Abbottabad*. 2015;27(4):780–3.
9. Owens KM, Keller S. Exploring workforce confidence and patient experiences: a quantitative analysis. *Patient Exp J*. 2018;5(1):97–105.
10. Madfa AA, Senan EM. Perception and confidence levels among dental students and interns in performing various endodontic procedures. *J Oral Res*. 2019;8(3):185–95.
11. Awooda E, Mudathir M, Mahmoud S. 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*. 2014;6(1):26.
12. Davey J, Bryant ST, Dummer PM. The confidence of undergraduate dental students when performing root canal treatment and their perception of the quality of endodontic education. *Eur J Dent Educ*. 2015;19(4):229–34.
13. Alrahabi M. The confidence of undergraduate dental students in Saudi Arabia in performing endodontic treatment. *Eur J Dent*. 2017;11(1):17–21.
14. 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 (Basel)*. 2016;5(1):1.
15. Patel J, Fox K, Grieveson B, Youngson CC. Undergraduate training as preparation for vocational training in England: A survey of vocational dental practitioners' and their trainers' views. *Br Dent J*. 2006;201(s5):9–15.
16. Shenoy V, Kumar R, Sumanthini MV. Interappointment Flare-up in Endodontics: A Case Report and an Overview. *J Contemp Dent*. 2012;2(2):53–6.
17. Tanalp J, Güven EP, Oktay I. Evaluation of dental students' perception and self-confidence levels regarding endodontic treatment. *Eur J Dent*. 2013;7(2):218–24.

18. Doumani M, Habib A, Alhababi A. The internship dentists' self-confidence levels during root canal treatment procedures. *Int J Dent Res*. 2017;5(2):121–4.
19. Ng YL, Mann V, Gulabivala K. Tooth survival following non-surgical root canal treatment: a systematic review of the literature. *Int Endod J*. 2010;43(3):171–89.
20. Lambrianidis T. Ledging and blockage of root canals during canal preparation: causes, recognition, prevention, management, and outcomes. *Endod Topics*. 2006;15(1):56–74.
21. Al-Omari MA, Dummer PM. Canal blockage and debris extrusion with eight preparation techniques. *J Endod*. 1995;21(3):154–8.
22. Haji-Hassani N, Bakhshi M, Shahabi S. Frequency of iatrogenic errors through root canal treatment procedure in 1335 charts of dental patients. *J Int Oral Health*. 2015;7(1):14–7.
23. Fasoulas A, Boutsioukis C, Lambrianidis T. Subcutaneous emphysema in patients undergoing root canal treatment: a systematic review of the factors affecting its development and management. *Int Endod J*. 2019;52(11):1586–604.

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