

## Original Research Article

### Comparison of video-assisted instruction and conventional teaching method's effects on students' performance in root canal obturation during Covid- 19 pandemic

#### Abstract

#### Background:

The purpose of root canal treatment is to prepare the root canal and obturate the entire the root canal reliably. The traditional method of teaching endodontics to dental students is the live conventional demonstration(CD). , Video –assisted clinical instruction in dentistry (VACID)is an educational tool that uses video-images to complement dental education. The aim of this study was to evaluate the effectiveness of VACID and CD on the performance of dental students in obturating the root canal.

#### Materials and Methods:

In this interventional study, thirty undergraduate dental students of Birjand University of Medical Sciences in 2021 were included in the study. They were equally divided in to three groups(n=10). and received instructions on root canal obturation via CD, VICAD and CD plus VICADThen, two endodontists evaluated the clinical performance of the students based onfinal radiographs of obturated root canals.blindly . Each student's score was calculated from 20. Data were entered into SPSS software and analyzed by ANOVA and Chi-square tests.

#### Results:

The mean± standard deviation(SD) grade point average (GPA) of students were not significantly different from each other (P = 0.398). The mean score of students' performance in all groups was not significantly different from each other (P> 0.05). The mean score of students' performance in terms of their gender in all three groups was not significantly different from each other (P> 0.05). The mean score of students' performance in terms of GPA in terms of evaluating teachers was not significantly different from each other (P> 0.05)

#### Conclusion:

The use of new educational methods, such as the production of educational videos, will be as effective as the usual demonstration methods for the performance of dental students during corona virus pandemic.

### **Keywords:**

Dentistry, instruction, Teaching, performance, Root canal, Obturation

### **Introduction:**

The goal of endodontic treatment is to prepare and obturate the root canal 3-dimensionally. All the steps of the treatment are important and, if done correctly, guarantee the long-term outcome of the tooth.(1,2) An ideal root canal obturation has three characteristics: 1. preventing the coronal microleakage 2. preventing the infiltration of fluids around the apex into the root canal system 3. embedding the remaining microorganisms after debridement, to prevent their proliferation and pathogenesis. (3,4) Failure to obturate the root canal leads to void, which is seen in 42.7% of cases and is the most common error, followed by over filling, which is seen in 18.2% of cases.(5) Dental students first pass pre-clinic units and then enter the clinic and work on patients.(6) The main method of teaching in the pre-clinic is the CD method, which is presented to students by teachers. The teacher explains the treatment process step by step.(7) This method has shown to be effective in increasing the self-confidence of students and their communication skills, as well as a better understanding of treatment process.(8,9)The limitations of this method are as follows: dependence of the training on the presence of the teacher, the possibility of forgetting important issues during the training, observing the treatment process from only one angle, non-repetition of important sessions, teaching complex treatment techniques in a limited session, increasing anxiety and student stress(6). For this reasons, researchers have tried to develop new methods to improve the quality of dental education.(10) Today, instructional videos are popular because students have the opportunity to watch videos several times.(11) The benefits of this method include storing a large amount of information, creating continuity in the educational process and reducing student stress during education.(12)

Numerous studies have been done with the aim of comparing the effectiveness of CD and VACID, which in some studies has reported the superiority of VACID over the CD method.(7-9) This is due to better observation of the treatment process and better mastery of details. In many studies, the VACID method has been introduced as a complement to the CD method and its positive role in advancing the treatment process has been mentioned.(13) These studies have been performed in various fields of dentistry, including prosthetics, orthodontics, endodontics, and restorative dentistry , but have not addressed the root canal obturation of multi-canal teeth, which is one of the most challenging topics in endodontic training. Therefore, in the present study, the aim was to evaluate the effectiveness of CD and VACID on the performance of dental students in obturationg the two root canals.

### **Methods and Materials:**

The results were analyzed and reported without the names of individuals. The study population consisted of 30 seventh- semester students of Birjand University of Medical Sciences. The inclusion criteria were students who are choosing the course of practical endodontics unit 1 for the first time in the academic year 2021. The Exclusion criteria were dissatisfaction to participate in the study and party / transfer students.

The sample size of this study was calculated using the study of Thilakumara et al.(11), the number of students in each group was 13 people. However, due to the existing limitations (according to the law of passing the prerequisite course, a number of students did not choose practical endodontics 1) and the criterion of entry and exit of 10 students in each group was considered.

Students participating in the study were randomly divided into three equal groups of 10 by block making method and triple blocks (ABC, BAC, CAB, ACB, BCA). Due to the Covid-19 condition, each group of study students was present in pre-clinic at different times.

Intervention method:

In the first group, the students receiving the CD (A), the teacher (endodontist) taught the students the steps of obturating the root canal of the two-canal premolar extracted tooth with lateral condensation technique) The students observed the treatment directly. In the second group (B), students were trained using a video based on specialized and scientific texts by an endodontist; In this way, the video link of "Lateral root canal obturation technique" with a time approximately equal to (average twenty minutes) what the teacher taught in the usual demonstration was provided to the students to refer to it as many times as they want. In the third group (C), students were taught by CD and VICAD .

Evaluation method of students performance:

After instruction, the maxillary two- canal premolars with the same length (average length = 20-22 mm) were prepared, so that after coronal preflaring with gates gliding # 1, 2 and 3 passively, one third of the apical of all teeth were prepared up to K-file # 30 (M-Access, Dentsply Sirona) and then by stepback method, the next larger files with a length of half a millimeter shorter than the length of the previous file, up to K -file # 60 (M-Access, Dentsply Sirona), were used. Also, after each filling, all teeth were rinsed with one ml of 5.25% sodium hypochlorite solution (Hyponic, Nick Darman Asia, Iran) using 30 gauge needles. All these steps were performed by a final year dental student.

Students obtured their teeth with eugenol zinc oxide sealer (Master Dent, USA) and gutta-percha (Tribest). Then, by two endodontists blinded to the group allocation of students, the clinical performance of the three groups in obturating the root canal was evaluated by final radiographs , which were taken with a parallel technique.

Each student's score was calculated from 20 (presence / absence of voids 0 to 8 points, obturation density 0 to 6 points and obturation length 0 to 6 points), then the average scores of each group were calculated. The score obtained did not affect the final score of the student unit, but if the student scored the full score, it was considered as a positive score.

### Students demographic informations:

In this study, the basic information of the participants, including their gender, age and GPA, was recorded by the facilitator in the questionnaire and in the checklist of each student. Students were divided into three groups according to their GPA: the first group: GPA 17 and above, the second group: GPA 14 to 17, the third group: GPA lower than 14.

### Data analysis method:

The data were entered in SPSS software version 18 and the descriptive results were reported as Mean  $\pm$  SD and relative frequency distribution. One-way analysis of covariance (ANOVA) was used for data analysis and for Chi-square variables at a significant level equal to 0.05.

### Results:

This study was performed on thirty students of Birjand University of Medical Sciences with a mean age of  $21.3 \pm 0.46$  years. Fourteen students (46.7%) were males and 16 students were females (53.3%). Based on the results of the present study, there was no significant difference between the frequency distribution of gender ( $P = 1.000$ ) and the mean age of students ( $P = 0.165$ ) in different groups (Table 1). The mean  $\pm$  SD GPA of students were  $17.29 \pm 1.34$ ,  $18.5 \pm 0.86$  and  $17.68 \pm 1.68$  in A, B and C groups, respectively which were not significantly different from each other ( $P = 0.398$ ). The mean score of students' performance in all groups was not significantly different from each other ( $P > 0.05$ ). Kappa coefficient based on the opinion of two evaluators was 0.146 ( $p = 0.06$ ), which at a significance level of 10% can be said that the agreement between the evaluators is significant (Table 2). According to the results of the present study, which is shown in Table 3, the mean score of students' performance in terms of their gender in all three groups was not significantly different from each other ( $P > 0.05$ ). The mean score of students' performance in terms of GPA in terms of evaluating teachers was not significantly different from each other ( $P > 0.05$ ) (Table 3).

Table 1: Comparison of the average score of students' performance by gender in three groups

Gender \ Groups	A	B	C	ANOVA statistical test result
Male	$17.42 \pm 1.78$	$17.5 \pm 0/0$	$18.6 \pm 0.41$	$P = 0.387$
Female	$17.19 \pm 0.98$	$19 \pm 0/0$	$16.16 \pm 2.02$	$P = 0.073$

Table 2. Comparison of the average score of students' performance according to the score of two teachers

Teacher \ Groups	A	B	C	ANOVA statistical test result
#1	17.65±1.49	18.66±0.57	18.25±1.48	P=0.427
#2	16.93±1.65	18.33±1.15	17.12±1.95	P=0.444

#1: MA

#2: SP

Table 3: Comparison of the average score of students 'performance in terms of students' GPA

GPA	17≤	14< <17	14≤	ANOVA statistical test result
Score of students 'performance	16.5±0.7	17.73±1.51	17.72±1.36	F=0.687 df=2 P=0.507

#### Discussion:

One of the most important educational principles is the appropriate teaching method that plays a significant role in the teaching process and is effective on learners' learning. In this regard, the present study was designed to compare the effect of CD and VICAD method on the performance of dental students in obturating the root canals.

The last two years, the coronavirus disease surfaced as an acute respiratory infectious disease in China which was later declared by the world health organization as a pandemic with high morbidity and fatality rates (14,15). The prevailing conditions lead to the popularity in idea of e-learning in dentistry [16]. **E-learning** incorporates an assortment of different terms like learning through internet, mobile education, computer-based learning, distant learning etc[17]. Students can easily reach out to the content of lectures while staying at home. This does not require the physical attendance at institutes, thus reducing the chances of transmission of infection [15]. In certain forms, computer-based learning aids in self-learning among students and further modifies their approach for knowledge acquisition.

According to the results of the present study, the mean score of students' performance in terms of faculty in all three groups was not significantly different from each other. Among the reasons for the insignificance of the results between the groups, we can mention the small sample size and the small number of students. We also assessed only the root canal obturation process, so the result was not significant, if we **evaluated** the **entire** root canal treatment process, the results between the groups might be significant. In the study conducted by Akhlaqi et al. (12), they stated that the mean score of knowledge in the different groups was significantly different from each other, so that the highest mean score was in the group receiving a combination of **CD** and **VICAD** that did not match our study. Among the reasons for results inconsistency, it can be pointed to the differences in the geographical area due to reduced facilities, the number of educational items in the city, the manner and method of teaching in different studies, the topic discussed in different studies.

In a study conducted by Al-Zain and Al-Osaimi (10), they stated that the instructional video was useful for teaching light-curing per the students' feedback; which was consistent with our study. In the study conducted by Naseri et al. (13), they stated that the average score of students' performance in preparing the access cavity in the two groups of demonstration and video was not significantly different from each other, which was consistent with our study. In a study conducted by Almohareb et al. (7), they stated that the mean performance score of dental students in class I and II amalgam cavities in the demonstration and video groups was not significantly different from each other, which was consistent with our study. In the study conducted by Alqahtani et al. (8), they stated that the average score of students' performance in making Adams clasp in the demonstration and video groups was not significantly different from each other, which was consistent with our study. In the study conducted by Inquimbert et al. (6), they stated that the mean score of students' performance in making fixed prostheses in the groups receiving routine training and video training was not significantly different from each other, which was consistent with our study. According to the results of the present study, it can be stated that video training will be as effective and practical as the demonstration training methods. Among the advantages of using video clips, we can mention frequent viewing, the possibility of moving the movie time, the possibility of using the movie in the free time of the learners, the possibility of making a stop and watching the movie again, and so on. The use of appropriate educational media is an important element in education, but they will not eliminate all educational problems, but they are certainly very useful and effective, because of the necessity of restricting students' existence in the dental schools due to COVID-19 pandemic. Based on the study data, the faculty would continue to use instructional videos as one of the teaching methods in the course. Additional verbal instructions would be provided to the group of students who watched the videos and needed additional instructions.

Conclusion:

The use of new teaching methods, such as the production of educational videos, will be as effective as the usual demonstration methods for the performance of dental students in viral disease pandemic.

#### Ethical Approval

In this interventional study, permission from the ethics committee (Ir.bums.REC.1399.161) of Birjand University of Medical Sciences was received.

#### Consent

Informed consent was obtained from all students.

#### COMPETING INTERESTS DISCLAIMER:

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. The paper was extracted from the thesis PhD dissertation of the second author(no.456144), Department of Endodontics of Dental Faculty of Birjand University of Medical Sciences.

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#### References:

- 1.Fernandes Zancan R, Hadis M, Burgess D, Zhang ZJ, Di Maio A, Tomson P, Hungaro Duarte MA, Camilleri J. A matched irrigation and obturation strategy for root canal therapy. Sci Rep. 2021 Feb 25;11(1):4666.
- 2.Kalantar Motamedi MR, Mortaheb A, Zare Jahromi M, Gilbert BE. Micro-CT Evaluation of Four Root Canal Obturation Techniques. Scanning. 2021 Feb 25;2021:6632822.
- 3.Bhandi S, Mashyakhy M, Abumelha AS, Alkahtany MF, Jamal M, Chohan H, Raj AT, Testarelli L, Reda R, Patil S. Complete Obturation-Cold Lateral Condensation vs. Thermoplastic Techniques: A Systematic Review of Micro-CT Studies. Materials (Basel). 2021 Jul 18;14(14):4013.

4. Marchiulynaite-Ustiliene R, Trisiniene J, Skucaite N, Auskalnis A, Veberiene R, Machiulskiene V. Microcomputed tomography evaluation of contamination with endodontic obturation material remnants in teeth with different root canal anatomy after post space preparation. *J Prosthet Dent*. 2021 Jun;125(6):900-904.
5. Haji-Hassani N, Bakhshi M, Shahabi S. Frequency of Iatrogenic Errors Through Root Canal Treatment Procedure in 1335 Charts of Dental Patients. *Journal of international oral health: JIOH*. 2015;7(Suppl 1):14-7.
6. Inquimbert C, Ferré A, Pourreyron L, Durand JC. Effect of a Procedural Video on the Practical Fixed Prosthodontic Performance and Stress among Preclinical Dental Students. *Eur J Dent*. 2021 Oct;15(4):612-617.
7. Almohareb T. A comparison between video and live demonstrations for teaching dental operative procedures. *Pakistan Oral and Dental Journal*. 2016;36(4):619-.
8. Alqahtani ND, Al-Jewair T, Khalid A-M, Albarakati SF, Alkofide EA. Live demonstration versus procedural video: a comparison of two methods for teaching an orthodontic laboratory procedure. *BMC medical education*. 2015;15(1):1-4.
9. Shqaidef AJ, Abu-Baker D, Al-Bitar ZB, Badran S, Hamdan AM. Academic performance of dental students: A randomised trial comparing live, audio recorded and video recorded lectures. *Eur J Dent Educ*. 2021 May;25(2):377-384.
10. Al-Zain AO, Al-Osaimi TM. Effectiveness of Using an Instructional Video in Teaching Light-Curing Technique. *Adv Med Educ Pract*. 2021 Mar 29;12:289-302.
11. Thilakumara IP, Jayasinghe RM, Rasnayaka SK, Jayasinghe VP, Abeysundara S. Effectiveness of Procedural Video Versus Live Demonstrations in Teaching Laboratory Techniques to Dental Students. *J Dent Educ*. 2018 Aug;82(8):898-904.
12. Akhlaghi NM, Khalilak Z, Vatanpour M, Moshari A, Ghaffari S, Namazikhah MS. Students' Knowledge Comprehension After Implementation of Live Conventional Demonstration, Video Teaching and Video-Assisted Instruction Methods in Endodontic Practice. *Iranian endodontic journal*. 2017;12(2):201-4.
13. Naseri M, Shantiaee Y, Rasekhi J, Zadsirjan S, Bidabadi MM, Khayat A. Efficacy of Video-Assisted Instruction on Knowledge and Performance of Dental Students in Access Cavity Preparation. *Iranian Endodontic Journal*. 11(4):329-31.
14. He J, Guo Y, Mao R, Zhang J. Proportion of asymptomatic coronavirus disease 2019: A systematic review and meta-analysis. *Journal of medical virology*. 2021 Feb;93(2):820-30.
15. Devine D, Gaskell J, Jennings W, Stoker G. Trust and the coronavirus pandemic: What are the consequences of and for trust? An early review of the literature. *Political Studies Review*. 2021 May;19(2):274-85.
16. Habib SR, Khan AS, Ali M, Abutheraa EA, Aljibrin FJ, Almutairi NS. An Evaluation of the Usefulness of YouTube® Videos on Crown Preparation. *BioMed Research International*. 2022 Jan 22;2022.
17. V. Nagendrababu, S. J. Pulikkotil, O. S. Sultan, J. Jayaraman, J. A. Soh, and P. M. Dummer, "Effectiveness of technology-enhanced learning in endodontic education: a systematic review and meta-analysis," *International Endodontic Journal*, vol. 52, no. 2, pp. 181–192, 2019.

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