IEJ
Iranian Endodontic Journal

Efficacy of Two Different Views of Video Demonstration in Teaching Access Cavity Preparation to Third Year Dental Students

Hazem Dabbour[a], **Amy Kia Cheen Liew**[b*], **Eason Soo**[a], **Dalia Abdullah**[a]

a Centre for Restorative Dentistry, Faculty of Dentistry, Universiti Kebangsaan Malaysia; b Centre for Family Oral Health, Faculty of Dentistry, Universiti Kebangsaan Malaysia

ARTICLE INFO

Article Type:
Original Article

Received: 27 Apr 2018
Revised: 24 Jul 2018
Accepted: 11 Aug 2018
Doi: *10.22037/iej.v13i4.20275*

**Corresponding author*: Amy Liew, Centre for Family Oral Health, Faculty of Dentistry, Universiti Kebangsaan Malaysia, Jalan Raja Muda Abd Aziz, 50300 Kuala Lumpur, Malaysia.

Tel: +603-92897854
E-mail: amyliew@ukm.edu.my

ABSTRACT

Introduction: Demonstration of the access cavity preparation procedures to dental students is challenging due to the limited operating field and the detailed nature of the procedures. The aim of this study was to develop and evaluate two different views in video demonstrations used to teach access cavity preparation. **Methods and Materials**: Two videos of access cavity preparation were filmed, one showing the occlusal view (OV) and one showing the sectional view (SV). Third-year dental students (n=57) who consented to participate in the study were divided into two groups to watch one of the videos. The perception and performance of both groups were compared using the Mann-Whitney U test and Fisher's exact test. **Results**: At baseline, group OV (n=29) and group SV (n=28) were not significantly different in terms of operative scores (P=0.330). After watching the videos, the basic understanding of the theories was similar in both groups. However, the SV group responded more positively towards the helpfulness of the video in visualizing the inner anatomy of the tooth and in implementing the procedures (P<0.05). The SV group also completed the exercise within a shorter time (P<0.001). Nevertheless, the quality of the prepared access cavities was not significantly different between groups. **Conclusion**: Within the limitations of this study, the additional step in sectioning a tooth before demonstration of access cavity preparation seems well worth the effort, offering the novice students advantages in visualizing certain anatomical landmarks and implementing access cavity preparation procedure within a shorter timeframe. Nevertheless, it did not improve the final quality of the preparations.

Keywords: Access Cavity; Dental Education; Endodontics; Root Canal Therapy; Video Demonstration

Introduction

Preclinical training is an essential part of dental education. During preclinical training, students are required to observe certain clinical procedures before they carry out exercises on extracted or artificial teeth. Watching the clinical steps demonstrated by the instructors helps the students develop and refine the perceptual motor skills necessary for a smooth shift into the clinical setting [1]. Also, close observation of the instructors allows students to develop professional vision: how to look, what to look for, and how to relate the clinical phenomena to the practice of dentistry [2]. Even tacit knowledge that cannot be articulated can be conveyed through demonstration [3].

However, the viewing of clinical procedures during live demonstration is often bounded by the small oral cavity, the narrow operative field and the intricate nature of the dental procedures [4]. This predicament is especially crucial in endodontics, as it is not easy to visualize the inner morphology and how instruments are functioning inside the tooth [5]. Traditionally, to perform an access cavity, the clinician is required to mentally visualize the location and the anatomy of the root canal system with the help of a two-dimensional view (usually by using the pre-operative periapical radiograph) [6, 7]. Clinicians must also be able to visualize the anatomical landmarks in the pulp chamber and the colour of the pulpal floor to locate the canal orifices [7]. This is crucial information for the clinician, but the process of identification may not be easily conveyed over video demonstration.

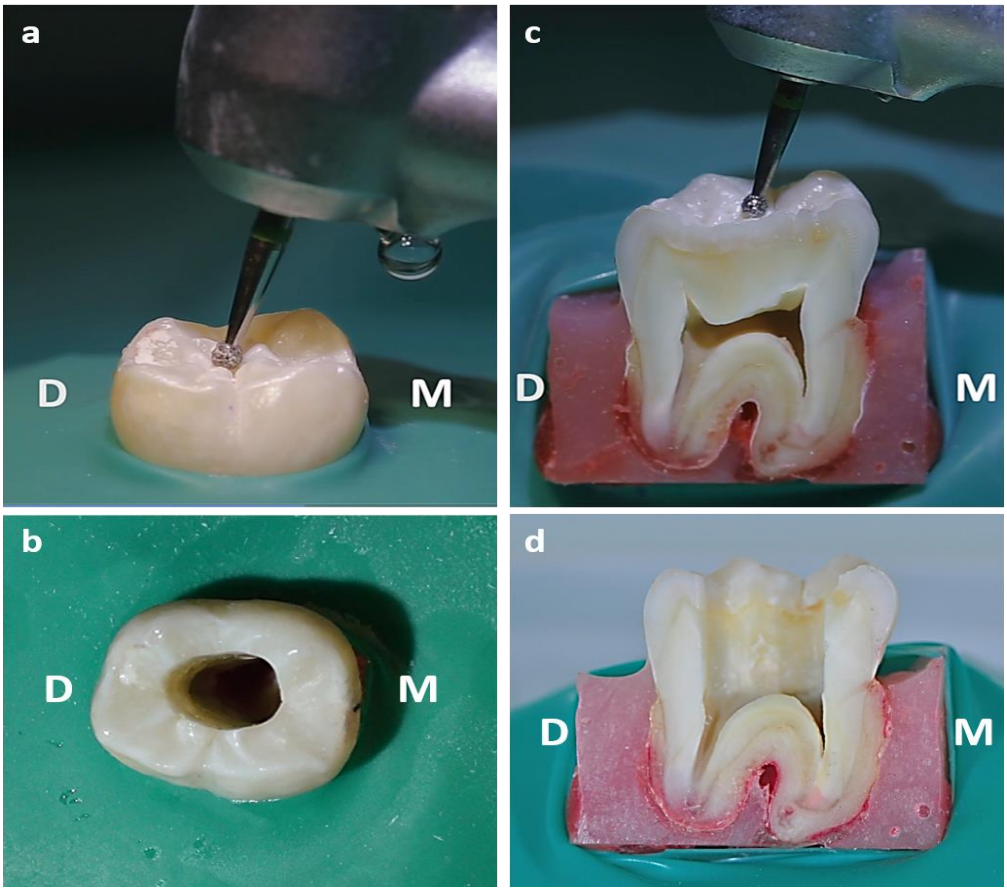

Figure 1. Filming of different views, *A)* Partial occlusal view was filmed with the camera angled at forty-five degrees to the occlusal surface of the tooth during the procedure; *B)* Full occlusal view (panel b) was filmed with the camera directed perpendicular to the occlusal surface of the tooth when the handpiece was not in use; *C &D)* Sectional view was filmed with the camera directed perpendicular to the sectioned surface of the tooth (D: distal, M: mesial)

Instructional videos have been found to be an effective teaching tool to demonstrate an access cavity preparation and can be used as an adjunct to conventional demonstration in dental education [8, 9]. The use of dental operating microscopes to produce the instructional videos has, to a certain extent, enabled students to visualize clinical procedures in fine detail. Students who were trained to use dental operating microscopes demonstrated improved ability to identify canals and prepare better access cavities [10]. Improved visualization, in turn, could be helpful in improving the understanding of the clinical procedures [11]. Nevertheless, the microscopic view in the videos does not always provide adequate information, particularly in orientating the viewers, because the area displayed by the microscope camera is limited [5].

Accessing the pulp chamber and identifying canal orifices in uncomplicated cases is one of the expected competencies of a dental graduate [12]. Indeed, access is the most important phase of nonsurgical root canal treatment, as it allows instrumentation and placement of materials within the highly complex root canal system [13]. Concurring with this, most textbooks recommend complete removal of the roof but often fail to provide guidelines or landmarks to indicate exactly where the access cavity should be extended [14].

An exception was noted in Cohen's *Pathways of the Pulp*. With the use of a diagram, the authors described the "mouse hole effect" resulting from inadequate access cavity preparation, and the canal orifice is depicted as extending into the axial wall. Conversely, adequate access results in the canal orifice being completely on the pulp floor. In the same book, a series of photographs showing a sectional view of a tooth during access cavity preparation provides step-by-step guidance to the reader [15]. In contrast, Rankow and Krasner took a different approach by creating the Access Box, a wooden box with its lid assembled in four pieces, one within another. The viewer looks at the top of the box as the lid pieces are removed one by one, from the center toward the edges, to appreciate the improved visualization of the orifices marked at the four corners at the bottom of the box [14].

The abovementioned methods point to the need to enhance students' appreciation of the anatomy of the root canal system during access cavity preparation. However, it is unclear which view is most helpful since none of these approaches were tested on students. Typically, when a demonstration is done with an extracted tooth, one would expect to see the procedure in the occlusal view, as portrayed using the Access Box or the "mousehole effect" analogy. However, the dental pulp is frequently represented diagrammatically in a sectional view in textbooks. A similar view is obtained in periapical radiographs. It is worth to explore which views could be used as the canonical viewpoint in video demonstration. Therefore, the aim of this study was to develop and evaluate two different views in video demonstrations used to teach access cavity preparation. The third year dental students' perception and performance were compared after each group of them watched the video demonstration of an access cavity preparation either in an occlusal view or the sectional view.

Materials and Methods

This study was conducted at the Faculty of Dentistry, Universiti Kebangsaan Malaysia. Prior to the commencement of the study, ethical approval was obtained from the Research Ethics Committee (UKM 1.5.3/244/JEP-2016-037). Fifty seven out of 58 third-year dental students (2016-17 academic session) gave written consent to participate in the study. At the time of the study, these students were at the initial stage of learning the basic theories of endodontics but had not yet carried out any practical exercises.

Two extracted sound lower first molars were prepared for the video demonstration. Both teeth had completely formed roots, with no caries or other lesions. The teeth were cleaned of all adherent materials and disinfected with 5.25% sodium hypochlorite (NaOCl) for one week. The teeth were mounted in cold-cured acrylic blocks. Pre-operative radiographs were taken to get an estimation of working length.

Two videos were recorded. Both videos covered the same content, starting with a slideshow presentation of the definition, objectives and ideal characteristics of access cavity preparation. In addition, the instruments required for this procedure were shown. Both recordings were performed by using a digital single lens reflex (DSLR) camera (Canon EOS 700D, Japan) and macro lens (Canon EF-S 18-135mm f/3.5-5.6 IS STM, Japan) at a fixed distance.

The first video showed the occlusal view of the non-sectioned lower molar. Demonstration of how to estimate the depth required to penetrate into the pulp chamber was shown by using the pre-operative periapical radiograph of the tooth. The measurement from the occlusal part of the crown to the pulpal roof was demonstrated by using a ruler and further with the use of the bur against the image of the tooth in the periapical radiograph. This stage was followed by accessing the pulp chamber, completely removing the pulpal roof and forming a straight line access [16]. To create an unobstructed view, filming of the procedure was recorded with the camera mounted on a tripod and angled at forty-five degrees to the occlusal surface of the tooth to show the partial occlusal view (Figure 1A). When the handpiece was not in use, the camera was directed perpendicular to the occlusal surface of the tooth to show the full occlusal view (Figure 1B).

The second video showed the sectional view of the lower molar, sectioned mesio-distally using Isomet 4000 Linear Precision Saws (Buehler, USA). In this video, access cavity preparation was performed using the exact technique described earlier. However, the camera was angled and maintained perpendicular to the sectioned surface, producing a sectional view (Figure 1C and 1D).

The two videos concluded with photos of iatrogenic errors in access cavity preparation. The importance of the access cavity was reiterated. Final editing was done to ensure similar flow and length for both videos. The narration was dubbed post-production to improve sound quality. The same narration was used for both videos.

A questionnaire was constructed to assess the students' perception of the helpfulness of the video in the areas of: (a) conceptualization (b) visualization and (c) implementation. The responses were in the form of a five-point Likert scale. For example, a statement as such is given: "The video made it easy for me to understand the objectives of access cavity preparation." In response, the students indicate whether they strongly disagree, disagree, somewhat disagree, agree or strongly agree. Parts (a) and (b) were filled immediately after the screening of the video, while part (c) was filled after completion of the access cavity preparation. A pilot study of 11 undergraduate students, not included in this study, was carried out. They were shown one of the videos, after which they completed the questionnaire. Based on their feedback, the methods of the study and the questionnaire used were considered acceptable.

Students were each told to prepare one lower first molar, mounted on a block made of plaster and sawdust with a periapical radiograph one week before the research. All teeth had to be sound with completely formed roots. An instructor

examined all the teeth and radiographs to ensure suitability. At the start of the practical session, students were briefed on the flow of the study. The students were divided into two; OV group and SV group. The members of the two groups were based on existing grouping, which was assigned randomly by the administration of the faculty without any knowledge of the study that would be carried out. For each group, the video demonstration and practical exercise were conducted in one session at the Simulation Laboratory. All the students were familiar with working in the simulation laboratory and using basic dental equipments such as the dental handpiece, as they had completed the Operative Dentistry course previously in their second year. To determine if there was a difference in baseline operative skills between the two groups, the scores of the students on the examination of the Operative Dentistry course in the second year were compared. Normality test showed that the data from the OV group significantly deviated from a normal distribution (P=0.017), but the data from the SV group were normally distributed (P=0.544) and therefore, the Mann-Whitney U test was used to analyze the differences between the groups. The scores were not significantly different between the OV (mean rank=30.53) and the SV (mean rank=26.31, P=0.330) groups which indicated that dexterity and basic operative skills at baseline were similar between the two groups.

The students in the OV group watched the video showing access cavity preparation done on the non-sectioned tooth, while those in the SV group watched the video showing access cavity preparation done on the sectioned tooth. After watching the assigned video twice, the students completed parts (a) and (b) of the questionnaire. Then, the students carried out the hands-on procedure of the access cavity preparation on non-sectioned molars. The time each student took to complete the access cavity preparation was recorded. Finally, the students filled in part (c) of the questionnaire. They were prohibited from asking the facilitator any questions or discussing with one another.

All teeth used in the hands-on procedures were collected, randomly coded, and examined by an endodontist. The examiner was blinded to the identity and grouping of the students. The access cavity preparations were assessed based on a list of pre-specified criteria. After the completion of this study, all students went through the complete training of endodontic, as dictated in the course description.

All data were analyzed using IBM SPSS Statistics version 23.0 (IBM Corp., Chicago, IL, USA). Statistical significance was set at 0.05. The Mann-Whitney U test was conducted to compare the questionnaire responses and time needed to prepare the access cavity between groups. Fisher's exact test was conducted to compare the quality assessment of the prepared cavity between groups.

Table 1. Differences between groups on the perceived helpfulness of the video in understanding the concepts of access cavity preparation

Perceived the video shown was helpful to:	Group OV Mean Rank	Group SV Mean Rank	*P*-value
Conceptualization			
Understand the objectives of access cavity preparation	26.67	31.41	0.222
Understand the steps of preparing an access cavity preparation	26.10	32.00	0.114
Visualization			
Visualize the location of the pulp horns	22.17	36.07	<0.001
Visualize the calcified dentine	21.52	36.75	<0.001
Visualize the map on the floor of the pulp chamber	21.28	37.00	<0.001
Visualize the location of the canal orifices	27.34	30.71	0.391
Visualize the location of the cervical dentin bulge	21.69	36.57	<0.001
Visualize the tapering of the prepared axial walls	20.21	38.11	<0.001
Visualize the final outline form	28.03	30.00	0.607
Implementation			
Remove the roof of the pulp chamber completely	24.07	34.11	0.010
Remove the calcified dentine	23.29	34.91	0.004
Follow the map on the floor of the pulp chamber	26.05	32.05	0.150
Prevent damage to the floor of the pulp chamber	26.28	31.82	0.190
Find all the canal orifices	27.31	30.75	0.414
Remove the cervical dentin bulge	21.71	36.55	<0.001
Create the tapering of the prepared axial walls	23.14	35.07	0.003
Achieve straight-line access	22.79	35.43	<0.001
Achieve the ideal outline form	25.10	33.04	0.053

Results

The OV group consisted of 29 students, of which 20 (69.0%) were female and nine (31.0%) were male. There were 28 students in the SV group, of which 22 (78.6%) were female and six (21.4%) were male.

The students' perceptions of the helpfulness of the instructional video showing the occlusal or sectional view were summarized in Table 1. Generally, the mean rank score of the SV group was higher than that of the OV group. Nevertheless, there was no significant difference of the students' perceptions regarding the helpfulness of the respective views in easing the understanding of the basic concepts in access cavity preparation ($P>0.05$). More students in the SV group, however, significantly perceived that the sectional view helped to improve their ability to visualize certain important anatomical features and to implement part of the procedures ($P<0.05$). The time taken by the OV group in preparing an access cavity (mean rank=37.53) was significantly longer than the time recorded for the SV group (mean rank=20.16, Mann-Whitney U test $P<0.001$).

The quality assessment of the access cavity preparation is summarized in Table 2. It appears that the common problems encountered by both groups were overextension and gouging or thinning of the pulpal floor. At a glance, higher percentages of under- and over-extension, along with iatrogenic damage, were noted on teeth prepared by the OV group, but the difference between groups was not statistically significant ($P>0.05$). Also, both groups were similarly competent in removal of the pulp chamber roof and identifying all the root canals ($P>0.05$).

Discussion

To date, there is very limited research on the best approach to facilitate video learning. In this study, students exposed to the sectional view of the tooth generally responded more positively towards the visualization and implementation of the procedure. This is particularly true for locating and altering certain landmarks, such as the roof of the pulp chamber, pulp horns, and cervical dentin bulge, as well as achieving tapered axial walls and straight-line access. In turn, greater appreciation of these ideas may be associated with the reduced time required to complete the exercise. The video also allowed the students to watch how the instruments move and cut the structure inside the tooth. This additional information from the video enhances the students' conceptualization and performance.

Theoretically, the occlusal view provides a more realistic life-like view when compared to the sectional view, therefore simulating actual clinical practice on patients. However, during the recording, the occlusal view was more obstructed by the handpiece and instruments during access cavity preparation. Therefore, the angle of the camera was fixed at an angle not in line with the head of the handpiece during filming. Also, footages were carefully edited to trim off obstructed views. Despite these enhancements in video quality, it was difficult to demonstrate the operation of the instruments in the canals.

Another reason for the positive responses towards the sectional view may be related to the students' visual-spatial ability. The three elements of visual-spatial ability are *i)* thinking in images or recognizing patterns; *ii)* mentally manipulating or rotating the images; and *iii)* using mental representations of visual patterns to solve spatial problem [17]. It is postulated that the three-dimensional spatial learning and visualization, rather than individual dexterity, is related to the efficiency of hand movement [18].

Table 2. Differences between groups on the assessment of access cavity preparation and iatrogenic damage

Assessment criteria	Group OV n (%)	Group SV n (%)	*P*-value
Access cavity preparation			
Underextension of external outline form	0 (0.0)	0 (0.0)	-
Overextension of external outline form	22 (75.9)	19 (67.9)	0.565
Underextension of internal outline form	3 (10.3)	0 (0.0)	0.237
Overextension of internal outline form	21 (72.4)	20 (71.4)	>0.999
Complete removal of the roof of the pulp chamber	25 (86.2)	25 (89.3)	>0.999
Identification of all root canals	19 (65.5)	21 (75.0)	0.565
Iatrogenic damage			
Supracrestal perforation	3 (10.3)	2 (7.1)	>0.999
Crestal perforation	3 (10.3)	1 (3.6)	0.611
Gouging or thinning of pulpal floor	16 (55.2)	19 (67.9)	0.417
Furcal perforation	4 (13.8)	0 (0.0)	0.112

Traditionally, both the occlusal and sectional view are shown whenever it is possible. Interestingly, there is some evidence to suggest that one may only need to view a three-dimensional object from the canonical viewpoint. Once this is learned, the viewer can mentally rotate the object. In a series of studies, Garg *et al.* [19] reported that when students were learning hand anatomy using a 3D computer model, most of them actually remembered a key view and rotated this mental image to complete the test given. Even when given the liberty to rotate the view on the computer, they spent more time studying from the key views, rather than the oblique views. The authors argue that additional non-canonical views could distract the students from the essential learning [19]. These findings lend support to the importance of providing canonical viewpoints for spatial learning.

It appears that the speed of mentally rotating an object can be improved with practice [20]. Although there was no evidence that dental education enhances spatial abilities in general or the ability to imagine cross-sections in general, learning dental anatomy and developing operative skills enhance the ability to imagine spatial mental models of teeth, especially cross-sections of teeth [21]. Hence, for the students in this study who had already learned about dental anatomy and had basic training in operative skills, seeing the access cavity preparation done in a sectional view may be advantageous.

The items that did not show statistically significant differences were those related to the visualization and location of canal orifices, preservation of the pulpal floor, and achievement of the ideal outline form. In textbooks, to provide an unobstructed view, usually the location of the canal orifices, the pulpal floor, and an outline form are illustrated in the occlusal view. Despite that, the students watching the occlusal view did not respond more favorably. When the access cavities were examined, a majority of the students from both groups over-extended the internal and external outline form, and some could not locate all the canals. Perhaps, this is a limitation which could not be addressed by instructional videos, regardless of the video design. After all, videos, much like radiographs, are at best a two-dimensional representation of a three-dimensional object.

In the past, access cavities tend to be standardized depending on tooth type, but in current practice, access cavity is now mostly determined by the individual pulpal morphology of the tooth being treated [6, 7]. Great variation among teeth [22] implies that the operators should have adequate knowledge, skills, and clinical judgment to uncover the canal orifices without unnecessarily compromising the tooth structure [23]. Instructional videos alone may not be adequate to build up the knowledge, skills, and clinical judgment of the students in this aspect.

To date, it is common knowledge that the limitation of live demonstration can be overcome by utilizing video demonstration with a close-up view. However, studies on the technical details that will enhance the viewers' experience and performance are scarce. In this study, we attempted to address part of the video design issue, which is the best view that can facilitate learning. The use of subjective and blind objective assessment illustrates different facets of the interventions.

Nevertheless, there are some limitations that affect the validity of the study and restrict the generalizability of the findings. The sample size in this study is small because each cohort at this institution averaged at 50 students. To counter this, we could include students from other batches or from other institutions. However, this will inadvertently introduce other sources of variance, such as baseline skills and school environment [24].

Ideally, randomization is carried out when assigning students to the two videos, to evenly distribute both known and unknown confounding variables between the groups. Logistical issues prevented such an arrangement, as the students' operatory units in the simulation laboratory were fixed. Because individual screens are not available in each unit, the screening could only be given to groups of students. Hence, quasi-randomization was implemented, as the pre-existing random groupings were already in place. However, it is uncertain how this may compromise the internal validity of the study by incorporating selection bias.

For future study, we recommend that researchers examine the relationship between the visual-spatial ability of the students and how instructional videos can enhance this domain. It would also be intriguing to find out what other aspects of video design can improve the viewers' experience and clinical performance. Such findings are timely and of great interest to dental educators, especially with the increased popularity of online educational platforms, where videos can be shared easily.

Conclusion

Within the limitations of this study, the additional step in sectioning a tooth before the demonstration of access cavity preparation seems well worth the effort, offering the novice students advantages in visualizing certain anatomical landmarks and implementing access cavity preparation procedure within a shorter timeframe. Nevertheless, it did not improve the final quality of the preparations.

Acknowledgement

The authors would like to thank the Faculty of Dentistry, Universiti Kebangsaan Malaysia for the provision of space and materials in the conduct of this study.

Conflict of Interest: 'None declared'.

References

1. Fakhry A, Dehkordi-Vakil FH. Video-Assisted Clinical Instruction in Dentistry (VACID) enhances real-time visualisation of clinical procedures. Eur J Dent Educ. 2007;11(4):238-44.
2. Hindmarsh J, Reynolds P, Dunne S. Exhibiting understanding: The body in apprenticeship. J Pragmatics. 2011;43(2):489-503.
3. Fugill M. Tacit knowledge in dental clinical teaching. Eur J Dent Educ. 2012;16(1):2-5.
4. Fakhry A, Cooper S, Slach N, Krenz S. Video-assisted clinical instruction in dentistry. Overview and applications. Eur J Dent Educ. 2007;11(4):230-7.
5. Rystedt H, Reit C, Johansson E, Lindwall O. Seeing through the dentist's eyes: Video-based clinical demonstrations in preclinical dental training. J Dent Edu. 2013;77(12):1629-38.
6. Patel S, Rhodes J. A practical guide to endodontic access cavity preparation in molar teeth. Br Dent J. 2007;203(3):133-40.
7. Mohammadi Z, Asgary S, Shalavi S, Abbott PV. A clinical update on the different methods to decrease the occurrence of missed root canals. Iran Endod J. 2016;11(3):208-13.
8. 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. Iran Endod J. 2017;12(2):201-4.
9. 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. Iran Endod J. 2016;11(4):329-31.
10. Rampado ME, Tjäderhane L, Friedman S, Hamstra SJ. The benefit of the operating microscope for access cavity preparation by undergraduate students. J Endod. 2004;30(12):863-7.
11. Seijo MO, Ferreira EF, Sobrinho APR, Paiva SM, Martins RC. Learning experience in endodontics: Brazilian students' perceptions. J Dent Educ. 2013;77(5):648-55.
12. De Moor R, Hülsmann M, Kirkevang LL, Tanalp J, Whitworth J. Undergraduate curriculum guidelines for endodontology. Int Endod J. 2013;46(12):1105-14.
13. Caceido R CS, Rozo D, Fullmer J. Guidelines for access cavity preparation in endodontics. ADA CERP. 2008;216:6.
14. Rankow HJ, Krasner PR. The access box: an Ah-Ha phenomenon. Journal of Endodontics. 1995;21(4):212-4.
15. Vertucci FJ HJ. Tooth morphology and access cavity preparation. In: Hargreaves KM CS, Berman LH, editor. Cohen's pathway of the pulp. 10 ed. St. Louis: Elsevier; 2011. pp. 136-222.
16. Johnson WJ WA. Isolation, endodontic access, and length determination. In: Torabinejad M WR, editor. Endodontics: principles and practice. 4 ed. St. Louis: Elsevier; 2009. pp. 230–86.
17. Kalbfleisch ML GC. Left brain vs. right brain: findings on visual spatial capacities and the functional neurology of giftedness. Roeper Rev. 2013;35(4):265–75.
18. Wanzel KR, Hamstra SJ, Caminiti MF, Anastakis DJ, Grober ED, Reznick RK. Visual-spatial ability correlates with efficiency of hand motion and successful surgical performance. Surgery. 2003;134(5):750-7.
19. Garg AX, Norman GR, Eva KW, Spero L, Sharan S. Is there any real virtue of virtual reality?: The minor role of multiple orientations in learning anatomy from computers. Academic Med. 2002;77(10):S97-S9.
20. Kail R, Park YS. Impact of practice on speed of mental rotation. J Exp Child Psychol. 1990;49(2):227-44.
21. Hegarty M, Keehner M, Khooshabeh P, Montello DR. How spatial abilities enhance, and are enhanced by, dental education. Learning and Individual Differences. 2009;19(1):61-70.
22. Rezaeian M, Tonekaboni MR, Iranmanesh F. Evaluating the Root Canal Morphology of Permanent Maxillary First Molars in Iranian Population. Iran Endod J. 2018;13(1):78-82.
23. de Toubes KMS, de Oliveira PAD, Machado SN, Pelosi V, Nunes E, Silveira FF. Clinical Approach to Pulp Canal Obliteration: A Case Series. Iran Endod J. 2017;12(4):527-33.
24. Chambers DW, Licari FW. Issues in the interpretation and reporting of surveys in dental education. J Dent Edu. 2009;73(3):287-302.

Please cite this paper as: Dabbour H, AKC Liew, Soo E, Abdullah D. Efficacy of Two Different Views of Video Demonstration in Teaching Access Cavity Preparation to Third Year Dental Students. Iran Endod J. 2018;13(4):474-80. *Doi: 10.22037/iej.v13i4.20275.*