Original Article

Comparison of Evidence-based and Conventional Education Effects on Radiography Assessment before Endodontic Treatment

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Abstract

Introduction: Evidence-based education has been introduced to dentistry as a new educational tool. However, its effectiveness should be evaluated in different educational topics. The aim of this study was to compare the effects of evidence-based and conventional education on radiography assessment before endodontic treatment.

Methods: In this semi-experimental study 75 senior dental students of Kermanshah Dentistry School were enrolled. Demographic information and the results of evaluation were collected using a weblog designed for this purpose. 20 questions were prepared to be answered in 30 minutes. 12 topics were covered in the questionnaire. To analyze the data, the paired sample t-test, Wilcoxon, and Whitney U tests were used.

Results: The finding of the present study showed that total scores of the test in both conventional and evidence-based groups significantly improved after education (P=0.005 and P=0.001, respectively). There was a significant difference between the two groups (P=0.047) and evidence-based education showed better results in comparison with conventional one.

Conclusion: The present study asserts that evidence-based education can lead to better diagnostic performance of senior dental students and thus can be used as an efficient alternative for conventional education methods in dental schools.

Keywords: Evidence-based, Education, Dental students, Endodontic, Treatment

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Introduction

Evidence-based activity is a concept that was created in Canada (1980) for the first time in medical education in order to use and give value to the research results raised from clinical data. Evidence-based activity is based on a complete comprehensive review of the results and researchers' findings with an emphasis on interventions and random clinical experiences as a standard, producing statistical results and making vital decisions about those results related to clinical evidence, useful instruments in studies and meta-analyses (1). In fact, it is an approach which requires the application of the relevant scientific information in relation to the patient's oral and medical health allowing the dentist to provide appropriate dental services for the

society (2). Quality improvement and educational standards are currently emphasized in pioneering countries in higher education (3).

Unfortunately, clinical education may be less effective due to several factors such as lack of planned training programs and inadequate knowledge of professors regarding clinical education methods (4). In order to plan educational programs, the needs of learners should be addressed, correct methods should be followed, and appropriate evaluation system should be devised to ascertain the quality of continuing education programs. In dentistry, like other aspects of science, the decisions of dentists in patient care depend on solutions obtained by experience or findings of research studies (5). Currently, many universities are in search of evidence-based educational methods that can warrant improvement of clinical decision-making in medical sciences and address the gap between theoretical knowledge and clinical performance (6). Dentistry field consists of some theoretical and mainly practical courses. One of the most important issues in a successful dental treatment is correct diagnosis and interpretation based on radiographic images (7). Dentists should be trained enough to diagnose normal anatomical landmarks as well as pathological changes (7, 8). Wuehrmann has described a method for interpretation of periapical radiographs consisting of structural reviews in a particular time and asserts that radiographic evaluation of periapical region is important when this region has to be assessed (9). In several studies periapical radiography assessments of dentists were unpredictable and inconsistent with pulpal and periapical diseases. This inconsistency leads to great differences in evaluation of different observers and a single observer in different times (10). Kaffe & Gratt suggest that dentists proficient in radiographic assessments should be trained and also more reliable and important features should be detected in radiographs to enable the dentists to have a precise interpretation. This correct interpretation can lead to time and money saving in dentist and patient, prevention from further retreatments and also in many cases loss of teeth (11, 12). Senior dental students in internship courses have successfully passed all theoretical and practical lessons including 3 practical and 3 theoretical units of oral and maxillofacial radiology and are a suitable group for evaluation of educational methods. Therefore, the aim of the present study was to compare the effects of evidence-based and conventional education on radiography assessment before endodontic treatment.

Methods

In this semi-experimental study, senior dental students of Kermanshah Dentistry School were evaluated in the first semester of educational year 2014-2015. Total number of senior dental students was 88. 8 students did not participate before starting the study and 5 other students did not take part in the second stage of education and evaluation. Therefore, finally 75 students participated and completed the stages of this study. These students were randomly allocated to control and intervention groups.

First, a weblog (www.endodonticsskills.blogfa.com) was designed and introduced to the participants. In this weblog initially the students were appreciated for their cooperation and given some information regarding study objectives. Based on the study design and aims, only students who had successfully passed all theoretical and practical units of oral and maxillofacial radiology were eligible to take part in the study. After confirmation of eligibility of students, they were given some information regarding the questions. The participants had 30 minutes for answering the 20 questions of the first stage. Afterwards, the students were randomly allocated to two groups; 37 students in the conventional education group and 38 students in the evidence-based education group. Students in the evidence-based education were educated using slides prepared according to the newest scientific findings on assessment of radiographs prior to endodontic treatment. The control group received conventional education using educational slides of the regular curriculum. The final stage of the study was post-education evaluation. These questions were designed similar to the pre-education questions but with different radiographs.

Questions of the pre- and post-education tests were designed to cover 12 subjects of radiography assessment before endodontic treatment. These subjects were as follows: diagnosis of additional canals and roots, diagnosis of periodontal ligament changes and lamina dura continuity, calcification, open apex, root length and root canal curvatures in mesiodistal and buccolingual views, diagnosis of root resorption, and vertical root fracture (VRF), diagnosis of lateral radiolucency, and diagnosis of periapical radiolucency. Each student was scored between 0 to 20 based on the number of correct answers.

To compare the scores of the two groups after education, initially the scores of the groups before education were compared. If no statistical difference was observed before education, comparison of the post-education scores was performed. If the groups' pre-education scores were statistically different, post-education scores were compared using layering method (score below mean value and score above mean value). To compare the test scores in various subjects (before and after the treatment) and also to compare overall score of the evidence-based group (before and after the treatment), non-parametric Wilcoxon

tests were used. To compare overall score of the conventional group (before and after the treatment), parametric t test was used. To analyze the data the paired sample t-test, Wilcoxon, and Whitney U tests were used. Level of significance was set on α=0.05 and SPSS.22 was used for statistical analysis.

Results

In the present study, scores were converted to percentages and analysis was performed based on these percentages. Table 1 demonstrates the mean values and standard deviations of students' scores.

Table 1. Mean values and standard deviation of student's scores and comparisons of before and after education in conventional and evidence-based groups

	Conventional education			Evidence-base education			Two groups Before	Two groups After
Diagnosis of	Before Mean (SD)	After Mean (SD)	P value	Before Mean (SD)	After Mean (SD)	P-value	P value	P value
Additional canals	**0.18 (0.16)**	**0.06 (0.11)**	**P<0.001**	**0.17 (0.2)**	**0.04 (0.08)**	**P<0.001**	**0.515**	**0.444**
Periodontal ligament changes	0.38 (0.3)	0.56 (0.25)	0.002	0.32 (0.25)	0.56 (0.25)	0.001	0.494	0.96
Canal calcification	0.31 (0.29)	0.39 (0.35)	0.096	0.41 (0.24)	0.53 (0.27)	0.026	0.038	0.36
Open apex	0.29 (0.25)	0 (0)	P<0.001	0.27 (0.25)	0 (0)	P<0.001	0.075	1
Root length	0 (0)	0.12 (0.28)	0.01	0.04 (0.14)	0.08 (0.2)	0.499	0.308	0.767
Root canal curvature in mesiodistal & buccolingual view	0.11 (0.31)	0.45 (0.5)	0.003	0.19 (0.4)	0.70 (0.46)	P<0.001	0.008	0.026
VRF	0.02 (0.08)	0.33 (0.29)	P<0.001	0.09 (0.16)	0.47 (0.26)	P<0.001	0.419	0.025
Root resorption	0.42 (0.22)	0.61 (0.31)	0.024	0.47 (0.29)	0.77 (0.32)	P<0.001	0.084	0.015
Lamina dura continuity	0.50 (0.23)	0.49 (0.27)	0.808	0.41 (0.23)	0.45 (0.2)	0.405	0.928	0.486
Additional roots	0.19 (0.18)	0.22 (0.14)	0.351	0.18 (0.16)	0.23 (0.12)	0.123	0.863	0.819
Lateral radiolucency	0.33 (0.27)	0.25 (0.23)	0.218	0.31 (0.24)	0.21 (0.18)	0.053	0.599	0.411
Periapical radiolucency	0.49 (0.32)	0.39 (0.5)	0.343	0.53 (0.35)	0.24 (0.43)	0.006	0.343	0.162
Total score	0.27 (0.04)	0.31 (0.09)	0.005	0.29 (0.05)	0.35 (0.08)	0.001	0.117	0.047

Comparison of the results before and after the education in different topics in conventional group showed that there was a significant difference (P<0.05) in 7 topics of diagnosis of: additional canals, periodontal ligament changes, open apex, root length and root canal curvatures in mesiodistal and buccolingual views, VRF, and diagnosis of root resorption, with a rise in the scores after the treatment. However, in the rest of the topics no significant difference was observed. The results of the comparison of the total score of the conventional group before and after the education showed that this score increased after the treatment and the difference before and after the treatment was statistically significant (P<0.05). Similarly the results of the scores in evidence-based group after the treatment showed that the scores in the following 8 topics increased in comparison with those before the treatment and this difference was significant (P<0.05): diagnoses of additional canals, periodontal ligament changes, canal calcification and open apex, root canal curvatures in mesiodistal and bucculingual views, VRF, diagnosis of root resorption, and diagnosis of periapical radiolucency. No significant difference was observed in the rest of the topics in this group. Also, comparison of total scores after the treatment in the evidence-based group exhibited that these scores showed an increase in comparison with the total score before the treatment and this difference was significant (P<0.05). Comparison of the scores between the two groups before the treatment showed that in diagnosis of canal calcification there was a significant difference between the two groups before and after the treatment (P<0.05) and in the rest of the subjects there was no significant difference (P>0.05). Comparison of the total scores in the two groups before the treatment showed that the total scores of both groups did not have any significant difference (P>0.05). In order to compare the scores in the subject of diagnosis of calcification after the treatment, layering method was used in both groups. The results showed that the score in this subject did not show any significant difference after the treatment (P>0.05). Comparison of the scores of the two groups in different subjects after the treatment showed that in 3 subjects of diagnosis of root canal curvatures in

mesiodistal and buccolingual views, diagnosis of VRF, and diagnosis of root resorption, the average of the obtained scores in evidence-based group was better than the conventional group and there was a statistically significant difference between the two groups (P<0.05), and in the rest of the subjects there was not any significant difference (P>0.05). Also the results of the study showed that the total score of evidence-based education group was higher than the score of students in conventional education group and this difference was significant (P<0.05) (Table 1).

Total score of evidence-based group after the treatment did not follow a normal distribution (P<0.05) but total score of conventional group before and after education and evidence-based group before education followed a normal distribution (P>0.05).

Discussion

Evidence-based education is considered as an educational revolution in all scientific fields including medical sciences (13). In the present study diagnostic performance of senior dental students after practicing two education methods was compared. As interpretation of radiographs is of considerable importance during different dental treatments, enabling future dentists to precisely interpret radiographic images can be done through appropriate education (14). In 2014 Razavian et al. in their study on senior dental students reported that evidence-based education led to significantly higher evaluation scores in comparison to conventional education (15). Moreover, the results of the randomized controlled trial performed by Goldberg et al. in 2000 showed that evidence-based education was superior to conventional method (16). Slavin in 2002 compared different educational methods and concluded that in information era the most successful method for improvement of knowledge and performance of students is evidence-based education (17). The review study by Hafslund et al. in 2008 noted that evidence-based education could promote radiologic services and reliance on scientific findings could lead to more efficient radiographic diagnosis and less harm to the patients. They stated that it was time to switch from conventional education to modern evidence-based education in institutes (18).

In 2014 Sutthiprapaporn et al. evaluated the diagnostic performance of dental students after lecture presentation in order to detect postmenopausal women with low bone mineral density. They reported that 73% of women with low bone mineral density were detected by students following the lecture presentation and concluded that this educational method was significantly effective (19). Also, Taguchi et al. demonstrated that evidence-based education was effective in diagnosis of postmenopausal women at risk of osteoporosis (20). Jabbari et al. reported the superiority of problem-oriented education compared to lecture-based education in teaching health instructions to the students (21). The findings of the present study indicated that pre- and post-education scores were significantly different in 7 topics in conventional education group and in 8 topics in evidence-based education group. In general, in both groups total score of post-education evaluation was significantly higher than pre-education evaluation. These findings are consistent with the results of the previously mentioned studies. Therefore, different studies suggest that educations delivered through different methods are effective in improvement of knowledge and performance. However, some educational methods lead to better results. To compare the conventional and evidence-based education, the findings of this study showed that the post-education scores were significantly higher in evidence-based education in 3 topics of diagnosis of root canal curvature in mesiodistal and buccolingual views, diagnosis of VRF, and diagnosis of root resorption. Sherwood evaluated radiographic diagnosis before root canal treatment. His results showed that diagnosis of root curvature in mesiodistal and buccolingual views, VRF, root resorption, and calcification was complicated (22). Thus, the results of the present study clearly demonstrate the benefits of evidence-based education in complicated diagnostic situations.

Conclusion

The present study asserts that evidence-based education can lead to better diagnostic performance of senior dental students and thus can be used as an efficient alternative for conventional education methods in dental schools.

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