

The Comparison of Learning Radiographic Extraoral Anatomic Landmarks through Lecture and blended method(Computer-Assisted teaching and Lecture): An interventional Study

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ARTICLE INFO

Article Type:

Original Research

Article History:

Received: 15 Jan 2013
Revised: 03 March 2013
Accepted: 11 Apr 2013
ePublished: 30 May 2013

Keywords:

Traditional lecture
Computer-assisted learning
Extra-oral radiography

ABSTRACT

Introduction: One of the main problems in learning extraoral radiographic anatomic indexes is the long interval between presentation of radiology and human anatomy courses, resulting in forgetting anatomic regions. Therefore, radiographic indexes are formed as complete abstract and transient images in students' minds; as a result, their learning and retention decrease. The aim of this study was to compare lecture with combination of computer-assisted learning and lecture of extra-oral radiographic landmarks among dental students. **Methods:** This interventional study was carried out in 2009 on 51 dental students of Tabriz University of Medical Sciences. Students were randomly allocated into two groups. The first group was taught through a teaching method which involved lectures in the classroom. In the second group, a CD was given to the students. The teaching was accomplished through presentation using skull. Six months after finishing the teaching, both groups took a similar test for evaluation of long term learning. The data was analyzed by SPSS 16 using U Mann-Whitney test. **Results:** There was no significant differences in the mean scores between the two groups in the first exam after teaching ($P=0.13$), yet it was significant in the second exam (regarding retention) ($P=0.006$), and average of non-traditional teaching method group (20.89 ± 10.23) was higher than that of lecture group (13.48 ± 6.39). **Conclusion:** Based on the results, non-traditional technique of teaching was not more effective than the lecture in short-term learning but in long-term learning, non-traditional technique was more effective than the lecture.

Introduction

One of the main problems in learning extraoral radiographic anatomic landmarks is the long interval between presentation of radiology and human anatomy courses, resulting in forgetting anatomic regions. Therefore, radiographic landmarks are formed as complete abstract and transient images in students' minds; as a result, their learning and retention decrease. Extraoral radiographs teaching through lecture was limited to teaching with some images of landmarks and there was no chance to remind the landmarks in the limited time of the teaching. It is, therefore, required to call the content to the mind of the students in an appropriate time out of the class to make the students attend in the class with background knowledge. One of the new methods is computer-assisted teaching. Learning Anatomic indexes with computer images and integrating it with radiographic images is an effective method.¹

Self-instructing through computer has impact on learning

due to its suitable physical conditions, individual security and reasonable cost², however, in some studies, female students were more willing to learn through lecture.^{3,4}

The traditional method merely consists of lectures along with the board and using the auditory ability of learners in the learning. Traditional lecture includes teaching without using Microsoft Power Point program. The conventional method generally provides lessons using Power Point Microsoft software through which visual and auditory abilities are involved in learning.⁵

Al-Jewair, in his study that compared the computer assisted method on students or residents in the field of orthodontics in terms of the effect of time failed to achieve any result, but there was a significant result in terms of the attitude and the cost-effectiveness and retention of information.⁶

Jenkins who had comparative study on lecture and computer-assisted learning among medical students passing skin morphology concluded that computer-aided learning was at least as effective as lecture.⁷

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Learning anatomy is a prerequisite for learning radiology and surgery because learning anatomy using three-dimensional computer images of the anatomy, gastrointestinal endoscopy and their relation with ultrasound images is effective. This method makes it possible to learn the true interpretation of images.⁸ Examining the CAL (computer-assisted learning) program in orthodontics showed the positive response of the students in comparison with other learning methods.⁹ Teaching classroom lecture with a possibility of question and answer seems to be more effective teaching method, regardless of the student's academic year, compared with the CAL method.¹⁰

Some studies showed that despite the lack of significant difference between lecture and tutorial computer¹¹⁻¹² computer-assisted learning should not be a substitute for lecture.^{4,11} particularly given that female students are more interested in lecture than the male.^{3-4,11} The results of a research showed that the lecture method was a supplement to self-instructed method with the help of computer and also the simultaneous use of skull while browsing the computer images through the laptop computers by the groups. The aim of this study was to compare the learning of anatomic landmarks in extraoral radiographs through lecture and blended learning methods among dental students.

Methods

This quasi-experimental study was conducted on junior dentistry students in Tabriz University of Medical Sciences in 2009. The whole numbers of the students were enrolled. Students were randomly assigned into two groups which. Students who were not willing to participate in the study were excluded. The students who did not participate in the studying classes were also excluded. Only 51 students participated in the study. The first group trained for lecture method using Microsoft Power Point containing radiographic images of the textbooks. A check list was used for data collection. At the end of class, students were given a table that contained 40 blanks to determine anatomic landmarks and extraoral radiographs to assess students' field of knowledge. The images were selected from the reference book and were set based on research objectives. To review the validity of the images, five specialists in the field examined the cases and the comments were applied. The landmarks on extraoral radiographs were identified on the slides and the students were required to insert the response in the table related to determining the landmark and kind of radiography after viewing. The correct answer scores 1, and incorrect zero. The minimum and maximum scores were zero and forty respectively. This class was held using blended method before the class.

In the second group, a CD including landmarks on the skull and the images related to those landmarks were given to the students a week before the classes to call the contents related to the anatomy to their mind. On the first day of the class, a test was done to assess only the students' background knowledge of anatomy and their intervention on teaching and its acceleration. The test conducted by radiology professor and residents with prior notice included oral questions about skull and some other questions on determining the anatomic parts of the skull. The students were classified into three groups: high, medium and low

based on their answers to the questions. Then students of each class were drawn separately and divided into four – student groups so that the groups had the same strong, medium and weak categories as far as possible (in order to get the help of stronger ones while teaching). The test was done not for the comparison of the teaching methods but for the unification of four – student groups. The class was held in Anatomy lab in medical faculty. The four – student groups sat side by side. The students were provided with a number of laptop computers and some skulls and there was a radiology post graduate students to help each group. The trainer began to teach using lecture method and the post graduate students helped the groups through the slides and the skulls simultaneously. Post graduate students explained all necessary things in a briefing session before the class. The students were tested in a similar way to the first group after teaching. After correcting the test answer sheets, the number of correct responses between the two groups were compared. The trainers were from radiology department of dentistry faculty. The same timing and content of teaching and presentation of the slides based on educational regulations were considered for each group. Six months after the first test, to assess the information retention, the second test quite similar to the first one was conducted for both groups at the same time without prior notice, while none of the groups did a study on extraoral radiographs after the first test.

The information relating to the characteristics and scores of students were kept confidential. Blended teaching method was fully applied to both groups after implementation to help the excluded students be benefited from the program. U Mann-Whitney test was used to compare the mean scores of the two groups and SPSS 16 use for data analysis. The p value lower than 0.05 was considered statistically significant.

Results

Fifty one students participated in this study and cooperated till the study was completed. The mean age of the participants was 28.46 ± 7.2 years old. The female and male participants were 31% and 69% respectively.

The difference of the first test's mean scores between the two groups were not statistically significant after teaching ($u= 165$ and $p= 0.13$).

The mean scores of lecture and blended teaching groups were 21.36 ± 7.09 and 25.83 ± 10.99 , respectively. The maximum scores of lecture and blended teaching were 27 and 36, respectively, and the minimum score in each group was 5. The mean difference scores of both groups to examine the information retention were statistically significant ($u= 113$ and $p= 0.006$), and the mean scores of blended teaching group was (20.89 ± 10.23) higher than the lecture one (13.48 ± 6.39). The maximum scores for lecture and blended teaching methods were 15 and 38 and the minimum scores were 2 and 3, respectively.

Discussion

This study was conducted to compare learning extraoral radiographs of anatomic landmarks through lectures and blended teaching methods. The results showed that there was no significant difference between the mean scores of two taught groups through lecture and blended teaching methods. This result was consistent with the results of

another study.¹³

No significant difference was obtained between the CAL method and other methods and it was suggested that this method be applied with lecture method.

Similar results have been obtained in short-term studies. It has been evaluated that students attitudes were positive toward CAL, although its effectiveness was the same as other methods in dental courses.¹³ Dental education is related to adult education. Adults are interested in learning with the desired speed and progress and also independent learning, which enables them to repeat the contents at any time, so CAL method makes it possible.¹⁴

The present study examined the information retention 6 months after the first test and a significant difference was obtained between the two studied groups. The result indicated the effectiveness of the presented method. Regarding the nature of the radiology course, for actual understanding of the anatomic structures, you need to learn deeper and long lasting interpretation of the images. The use of various anatomic features of the skull, three-dimensional mental reconstruction and transferring it to the radiographic images are effective in information retention. According to what mentioned above, the present study has indicated that the blended method could provide an objective learning. The teaching will be more effective if it is along with questions and answers.¹⁰

Liberman study on the comparison of computer- assisted learning method and particular lecture method (interactive tutor) was conducted on a smaller group. The low number of learners in the lecture method made the discussion and the exchange of ideas possible, as a result the learning was much deeper. The students preferred the teaching in small groups to the CAL method. The comparison of CAL method with other methods is not valid when teaching content, teaching style and ... are different.¹⁰ Therefore, the educational method and content were the same for both studied groups. Although private methods are more effective than self-instructed methods because of the possibility of discussion, actually, learning through the mentioned method is not possible due to the limited training time. There was a limited possibility of solving the problem in the present study through blended method with the help of the post graduate students.

However, unlike Liberman study, in this study the students preferred blended method to lecture because in this study the lecture was for a big group whereas his was small and there was the possibility of discussion.¹⁰ In Jenkin study, no significant difference was found between two studied groups (CAL, lecture) in learning dermatology. Similar results were obtained in urology, surgical techniques and neuroanatomy. Yet, the CAL method of learning leads to learning in shorter time than the lecture. In the present study, the results of the first test was similar to Jenkin's, but a significant difference was observed in the long term. Jenkin study only included short-term learning and long-term learning has not been evaluated. CAL method was not effective in Jenkin study because the research was on a part of dermatology course. Thus, low data has been studied. Since only a part of the course was studied in this study, the result was similar to the short term test results.⁷

Learning anatomy through CAL method using three-dimensional images can lead to a real learning.⁸ Although,

computer images were two-dimensional in this study using blended method, real learning was possible due to the simultaneity of teaching and radiographic interpretation by studying the skull. High mean scores of the second group in the retention test verified this claim. The second test was given without prior notice and the students took part in the exam without previous study.

If the students are given the opportunity to review the content, the result will be more effective.

Despite the advantages of blended method, there were difficulties in providing such method which needed the close cooperation of faculty members and students to overcome them. It was needed to spend considerable time on coordinating the officials in anatomy lab, testing anatomic structures through blended method, coordinating the residents as the assistant team and limited education time before holding the classes. The possibility of discussion was less in this presented blended method because of the limited education time. Lack of significant difference in comparison of CAL with other methods shown in the studies doesn't mean the lack of difference but it means that there is no sufficient evidence to reject the null hypothesis (no difference), so the researches with larger sample sizes are needed.¹⁴

Conclusion

Blended method in teaching extraoral radiographs (computer-assisted learning and lecture methods) was more effective than the lecture method in long-term learning.

Therefore, considering the results of the present study, the preferred method for teaching extraoral radiographs is blended method in comparison with lecture.

Acknowledgment

The researchers would like to render their thanks to Council for Research in Education Research Center, Tabriz University of Medical Sciences, Dr. Soliemani and Dr. Notash for their cooperation.

Competing interests

None to be declared.

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