Students, perception of computer assisted teaching and learning of anatomy-in a scenario where cadavers are lacking.

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Abstract

Computer software program for three dimensional (3D) modeling of anatomical structures in the human body that presents detailed and step by step cadaver dissections can be used for computer assisted teaching and learning of anatomy. Anatomical drawing, models, skeletons, and live demonstrations supplement the classroom learning environment. It can provide detailed human anatomical training for students, where there is a lack of cadaver facility. The multimedia equipped interactive Anatomical laboratory software's enhance both memorization and visual learning skill and has been shown to be an effective teaching aid (Guy & Frisby, 1992), they will improve imaging data analysis and so represent a major advance in determining prognosis and therapeutic strategy. THE AIM of the study is to survey student's opinion/perception on the use of computer assisted classes for teaching anatomy and to determine the place of computer in the teaching—learning process of anatomy to bachelor of medicine and bachelor of surgery (MBBS) students, as whether they can replace or substitute cadavers. A questionnaire model was given to MBBS students. While studying anatomy, the students accessed a room equipped with computers containing previously loaded anatomy programs. The analysis of the questionnaire showed that for students the computer room considerably facilitate the study of anatomy in easy manner and also potentially increases the understanding of the lesson, at the same time considered that the computer room cannot replace cadaver dissection.

Introduction

The use of cadavers has been the chief pillar for learning anatomy [1], in addition to the process of dissecting a cadaver as a teaching method [2, 3]. However, the limited availability of cadavers, the difficulties imposed by the ethical issues for their use, among other arguments [4], have leads to use of substitute such as anatomical models. Recently specialized software has been used to help students learn the 3-dimensional spatial relationships of anatomical structures [5]. As anatomy learning strongly depends on images and diagrams, it is particularly amenable to the use of computer science. The computer make lectures more interesting for students by means of multimedia presentations [6, 7], research on the efficacy of computer based learning suggest that it enhances student's performance in examinations [8], reduces the time to spend for studying [9]. The major advantages of computer based anatomy teaching are in the areas of time and cost saving. Students and instructors have spared hours of laboratory dissection time and department is saved from the recurring cost of purchasing and disposing of preserved specimens. Computer assisted learning (CAL) also enables undergraduate institution which lack cadavers, the opportunity to offer a detailed course in human anatomy through stimulated dissection of system or region. It also offers comparison of the structures with radiographic and magnetic resonance images in addition to the histological appearance of that structure. It allows a structure to be zoomed and rotation of the images between the four views (i.e. ant, Post, med, lateral). The operator can also specify a structure by name and can obtain a highlighted view, or ask for an identifying label on the structure, by projecting images on to a large screen for lecture purposes. Computer software program has the facility for pathological material to be added as an illustrative point when regional anatomy is being demonstrated, through this possibility of, incorporating existing teaching material into program such as study guides, sample question and histological and radiographic material.

Disadvantages are that these programs are like a text book that is operated on a computer, there is little feeling for the 3D relationship in some areas of anatomy, that dissection offers for example the pelvis and the perineum are difficult areas to comprehend. They do not make any easier way to understand by these programs so human dissections still remain an essential teaching aid. They do not provide adequate information on neuroanatomy and related neurology, sometime student find it difficult to identify individual structures and fully grasp their three dimensional relationships. Various popular Software are available for computer assisted learning and teaching anatomy for example, the Anatomy laboratory (substitutes for the traditional dissection laboratory), A.D.A.M. Interactive Anatomy (web-based interface through which they can acquire information about the anatomical sciences), Dynamic Human, 3D-DOCTOR (3D medical imaging software for creating 2D models from computerized tomography (CT), magnetic resonance imaging (MRI) and microscopy images), Anatomy.t (3D anatomy in which possible to rotate the view, add and remove layers of anatomy), Anatomy Explorer (Biotech Virtual, anatomy 3D software in which is possible to explore, identify, and describe in a gradual and qualitative way characteristics, relations, hierarchy, and physiological processes of the human body), anatomy atlases (A digital library .multimedia textbooks e.g.; atlas of human anatomy in cross section; Atlas of microscopic anatomy; illustrated encyclopedia of anatomic variation and human anatomy learning site (its aims to learn clinically relevant anatomy with maximum efficiency).

Materials and Methods

This quantitative study, carried out in the department of Anatomy, Jawaharlal Nehru Medical College, (JNMC), Aligarh. After the theory classes, students had to access to computer room where anatomy programs had been previously installed on computer. In the computer room, students were divided into groups, and used Anatomy software, which they were taught how to explore. At the end students participated in the study by filling in a questionnaire. The questionnaire used to elicit students perceptions/opinion of the use of computer room in computer assisted teaching and learning of anatomy consisted of 15 multiple choice questions (MCQ), for each question the student had to select one of five possible answers: not at all, only a little ,to a certain extent ,very much, and completely.
1. Do you think that the computer assisted teaching and learning of anatomy help in the study of anatomical structures in a scenario where cadaver is lacking? 2. Does it enhance understanding of the objectives of the class? 3. Is it preferable to studying cadavers? 4. Does the lack of experience (familiarity) with computer affects the study of the computer assisted teaching and learning of anat-

omy? 5. Does it provides the real touch feeling of human body (ligament, tendons, muscles and bone) as in cadaver dissection? 6. Did you feel the need for a computer room in the study of anatomy at a large extent (In respect of hours and days)? 7. Is it worthy to study 3-dimentional relationships (deep, superficial, medial, and lateral) of the various structures (bones, muscles, arteries, veins, nerves, organs) with in a particular body region? 8. Can it replace dissected cadavers in teaching of anatomy? 9. Whether students are immeasurably disadvantaged if denied access to cadavers as a teaching tool? 10. Does it provide important elements in learning process that are not obtainable by others? 11. Is it true that anatomy software program are better at conveying 3-dimentional relationship (Anatomy) through the use of cross sectional anatomy from CT and MRI scans? 12. is the use of the computers a supplement to cadavers rather than a substitute? 13. Does it provide opportunity to use multiple resources i.e. books, atlas, cadaver Material and plastic models etc. 14. Is it useful in learning the subject outside the class room, such as the review of Anatomical material, dissection steps, video etc?

Data Analysis: In the descriptive statistics the frequency of the replies was determined for each item of the questionnaire: in the Analytical statistic it was verified whether there was significant difference in the replies according to the student's gender, using the Mannwhitney nonparametric statistical test considering the choice of answers on an ordinal scale from 1to 5.

Results

An analysis of students opinion of questionnaire related to CAL of anatomy showed that fewer students agree that the lack of familiarity with computer does affects the study of the CAL of the subject. Almost all students agree that it does not provide the real touch feeling of human body as in cadaver dissections. However, the majority of students (52%) indicate that there is need for a computer room at a large extent (in respect of hour and day) for learning and teaching of histology. For 48% students the use of the computer room is very beneficial in the study of anatomy, as well as greatly enhancing understanding of the objective of the class .furthermore, most students (62%) considered these teaching resources to be of great importance for studying anatomy. However 40% students indicated that they did not prefer it to cadaveric material, although it is interesting to note that a considerable percentage of students showed a strong preference for CAL of the subject (20%). Moreover, the vast majority did not like the idea of replacing cadavers by a computer room. Majority of students agree that 3-dimentional relationship of the various structures can be studied through the use of cross sectional anatomy from CT and MRI scans. Vast

majority also agree that CAL provides opportunity to use multiple resources i.e. books, atlas, cadavers material and plastic models etc even in the presence of cadavers, because students willing to have clear perception of concepts would try to access these. Majority of students (42%) considered that CAL of anatomy is useful in learning the subject outside the class room, such as the review of anatomical material, dissection steps, video etc. The

difference in the pattern of answers regarding the replacement of cadavers according to the student's gender, with majority of female students prefers computer assisted learning and teaching of anatomy (fewer female students rejecting such a replacement) reflect gender difference in attitudes to the handling of cadavers. With the other questionnaire responses showed no significant differences between the sexes (tables).

Table 1. *Students, perceptions/opinion to item of Questionnaire related to CAL and teaching of Anatomy, where cadavers are lacking*

S. N.	Questionnaire	Students Perceptions/Opinion				
		Not at all	Only a little	To certain extent	Very much	Completely
1.	Does it help where cadavers are lacking	0%	5%	24%	45%	26%
2.	Does it enhance the understanding of class	0%	5%	24%	45%	26%
3.	Is it preferable to studying cadavers	40%	17%	24%	16%	3%
4.	Does the Lack of familiarity with computer affects CAL Anatomy	60%	20%	15%	5%	0%
5.	Does it provide the real touch feeling of human body	90%	8%	2%	0%	0%
6.	Is there the need for a computer room in anatomy study	50%	15%	24%	8%	3%
7.	Is it necessary for the study of anatomy	55%	14%	22%	9%	0%
8.	Does it provide 3D relationship of the subject	0%	0%	3%	7%	90%
9.	Is it useful in learning the subject outside the class room	0%	10%	24%	24%	42%
10.	Is it a supplement to cadavers rather than a substitute?	0%	10%	16%	32%	42%

Table 2. *Gender difference in response to "Can it replace dissected cadavers in the teaching of Anatomy"*

S. No.	Gender	Students Perceptions/Opinion				
		Not at all	Only a little	To certain extent	Very much	Completely
1.	Male	80%	5%	15%	0%	0%
2.	Female	52%	14%	20%	8%	6%

Discussion

The computer room facilitates the study of anatomy as well as understanding of the objective of the class. Our study is consistent with the result of earlier studies on the effectiveness of computer based learning [7, 8, 10]. Those students did not show very much interest in learning anatomy, CAL and multimedia made these subjects more appealing to them. The fact that students considered the use of computer room a necessary resource in anatomy teaching, even though most of them did not show preference of this tool over cadaver material. In this study we come to

know that CAL preference to anatomy does not mean we minimized the role of cadaver's dissection because it is an essential technique in teaching 3—dimensional concepts. Ashraf Aziz et al [1] emphasized that cadaver dissection is not only still necessary but also that "cadaver- based anatomical education is a prerequisite for optimal training in the use of biomedical computer applications" if we consider anatomy to be basic knowledge for clinical subjects, we agree with that the "computers cannot lead students to the requisite reasoning that comes from investigative dissection of real tissue as reported by Miller et al [11].

Preferences for CAL are influenced by their familiarity with computers or by their attitude to dealing with cadavers. A lack of experience with computer in few percent students might have reduced student's preference for the computer room. From the results of the present study, it may be inferred that students perceive the use of computer room, computer in general as a necessary instrument in facilitating the study of anatomy, but as a supplement to cadavers rather than a substitute. In view of the fact that the interface provided by computer software influences the students learning process and satisfaction.

Conclusion

Increasing tendency to introduce computer and software in education as a supplement in the teaching –learning process, could reach dangerous levels when the idea of introducing goes further and pretends to replace other procedures or elements that have been the basis of certain areas of knowledge. As we agree with the concept that "physicians with a through knowledge of anatomy limit the use of expensive technique of diagnosis" and improved education of doctors in basic of the anatomy could be the most effective approach to improved diagnosis, rather than use of new diagnostic methods [12].

In the end, the two approaches cadavers and computers (used as symbols of practical and theoretical models) are best seen as complementary. I believe that computerization will begin to make enormous contributions to the learning of basic anatomy.

Overall at this initial stage of medical profession computer assisted learning system offer flexibility, enabling students to choose the place, time, pace and process of learning, the use of computer rooms can also be useful in learning outside the classroom, such as the review of anatomical subject matter required by students in the later stages of the training in the health care area.

Acknowledgment

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