

Original Article

Is the use of PowerPoint Presentations a Better Tool of Understanding Gross Anatomy than Cadaveric Dissection?

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Objective: To study the performance of 1st year medical students in structured exams of gross anatomy after exposure to demonstration with cadaveric dissection in comparison to demonstration with powerpoint presentations (with images and animation).

Place & Duration: Anatomy Department, Wah Medical College, From Jan to Feb 2010.

Study Design: Randomized Control Trial (The cadaveric dissection methodology and the powerpoint presentations were themselves an intervention for two groups)

Materials and Methods: 64 first year medical students were divided equally in two groups by random sampling. Group I was exposed to demonstration with dissection and group II was taught with PowerPoint aided demonstrations only. A questionnaire with four close ended questions each with four options was administered to students wherein they were asked to compare the benefits of both teaching methodologies. After exams, independent and paired sample t tests were used to compare the means of obtained marks across and within groups respectively. Passing status of both groups was compared by Chi.²

Results: Means of obtained marks (viva voce, written and collective) by two groups were compared by independent sample "t" test which proved insignificant ($P=0.618$, 0.306 and 0.698 respectively). A within group comparison (paired sample t test) of written and viva voce means yielded insignificant statistical difference in group I ($P=0.80$), while means of viva marks of group II was significantly less than that of written ($P=0.001$). Chi² comparison of passing status between groups revealed insignificant results ($P=0.86$). In questionnaire 46 (74.2%) students showed inclination towards a hybrid methodology for learning of gross anatomy encompassing dissection and powerpoint presentations.

Conclusion: In a Pakistani medical college dissection helps the students in achieving same level of skills needed for written and oral expression, whereas students not exposed to dissection face a difficulty in developing indepth understanding necessary for good oral expression.

Key Words: Anatomy, Dissection, Multimedia

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Introduction

Despite the fact that anatomy is the keystone of all medical subjects, modern medical curricula have shortened the time frame committed to it hence affecting the quality of its education. To complete the course within limited hours, while maintaining the standard level of education is no doubt a big challenge for all Anatomists and the entity most threatened by this challenge is "Dissection".¹ The interaction of students with cadavers during dissection builds the deep insight of anatomy and gives them approach towards the logical

understanding. That is why dissection is considered to be one of the most important tools for teaching this subject.² It can be further emphasized by the suggestion that the use of cadavers for both research as well as teaching may encourage a more evidence-based approach to clinical application of normal structure.³ Importance of dissection in anatomy learning can never be denied but in order to keep pace with the new direction of medical education, we should also consider some new methods and other teaching resources that could determine useful change in the conventional style of teaching. PowerPoint animations and images have

been documented as a powerful tool of teaching of gross anatomy.⁴ Elizondo-Omar et al⁵ documented in 2004 that computer assisted learning for gross anatomy when combined with traditional teaching yielded better results. Another study which compared the effectiveness of cadaveric dissection with use of image technology for teaching anatomy supported the combined approach of training⁶ but no such comparison in Pakistan has been documented so far.

This research aims to compare the effectiveness of two methodologies of gross anatomy learning i.e. demonstration with dissection versus demonstration with PowerPoint presentations with images and animations projected through multimedia by comparing the assessment results of students exposed to each in a Pakistani medical college.

Materials and Methods

Sixty four first year students of Wah Medical College, session 2009-2013, were involved in this randomized control trial for which permission from administrative and academic authorities of the college was obtained prior to its commencement. The project began at the start of tenure for the course of second substage of upper limb. The students were divided equally into two groups, group I and II (32 students each). For the first substage all students had been introduced to general terminologies and concepts of gross anatomy with the help of dissection and PowerPoint presentations both. These concepts were necessary to comprehend the subject in subsequent substages.

The students were selected without prior knowledge of their results in previous substage. They were selected by consecutive sampling (non-probability). The total number of 64 students was divided by randomization (lottery method) in two equal groups of 32 each. Two students were dropped out of the study at the time of assessment (one was not allowed due to short attendance and one left the college due to personal reasons). Informed written consents were obtained from all selected students. Group I was exposed to methodology of demonstration (small group discussion facilitated by teacher) & dissection. These students dissected the upper limbs of cadavers themselves under the supervision of lecturers in the dissection hall. Students of group II received demonstrations with the help of powerpoint presentations (with images and animations) projected through multimedia but were not allowed to dissect or study the human cadavers and specimens. Out of all faculty members, two competent and enthusiastic lecturers with same level of teaching and computer skills were selected for this project. To minimize the associated bias, topics of the course were divided between these two lecturers; each lecturer taught the same topics to both groups with the

methodology outlined for each group (group I received their demonstrations and performed dissection, while at the same time group II was facilitated with PowerPoint presentations). Both lecturers however, were not involved in the subsequent assessment of students.

The students of both groups followed the same time schedule and were facilitated for two hours daily for fifteen working days for completion of course. The course was distributed in such a manner that two hours were consumed justifiably in practical work by group I, studying by group II and facilitation of both by teachers. Both groups were exposed to same examination at the end of the course. Only those students were allowed to sit in the exams who had attended at least 80% of classes. Examinations included one best type multiple choice questions (MCQs) with five options each, short essay questions (SEQs) and structured viva voce with pre decided questions, answers and marking scheme.

Written paper including MCQs and SEQs was prepared by Assistant Professor under the auspices of Associate Professor and Professor of the department according to the standards laid down by the University of Health Sciences, Lahore.

Following written paper, students of both groups were distributed for structured viva voce among the faculty members (excluding the lecturers involved in teaching). The examiners were unaware of the experimental group of students they examined.

Written papers were checked by the same examiners against structured keys. The results (written, viva voce and collective) of both groups were recorded and means of achieved marks were calculated. Means of all three variables were compared between both groups by independent sample t test. A comparison of means of written and viva voce marks was carried out within the groups as well. This was done by paired sample t test. Students with 50% and above marks were declared pass (as per the passing criteria laid down by the University of Health Sciences with which the college is affiliated). Number of failures and passes were compared by chi square test. All statistical tests were applied using SPSS version 17.

After the examination, students were also asked to fill a questionnaire having four close ended questions each with four options. In summary the questionnaire dealt with students' perception regarding the superiority of one teaching tool above the other in enhancing their cognition.

Results

In group I thirty out of thirty two students appeared while in group II all thirty two students took the examinations. Total marks allocated were 100.

Means of overall collective marks obtained by students of group I when compared with the same of group II, yielded insignificant statistical difference (Table I). The

outcome was not different when means of viva voce and written components (MCQs and SEQs inclusive) were compared between both groups ($P=0.618$ and 0.306 respectively).

When means of marks of written and viva components were compared within groups, outcome for group I was statistically insignificant ($P=0.80$), while means of marks of viva voce of group II were found to be significantly less than that of written ($P=0.001$)

Table I: Means and statistical comparison of collective marks obtained by both groups

GROUPS	Means of Collective marks $\pm$ S.D.	*P Value
I n=30	54.27 $\pm$ 15.38	0.698
II n=32	55.69 $\pm$ 13.27	

*= P value computed by independent sample t test

Comparison of students on the basis of their passing status was carried out using Chi² test. The obtained P value of 0.86 showed insignificant statistical difference (Table II).

Table II: Performance of students on the basis of passing status

GROUP	Passing Status		
	Fail	Pass	Total
I n=30	10	20	30
II n=32	10	22	32
Total	20	42	62

From all the filled questionnaires it was observed that more than half (46/62) of the students preferred the combination of dissection and powerpoint presentations through multimedia for learning gross anatomy, while almost half (32/62) of the students agreed that this combination makes the learning interesting (Table III).

Table III: Four questions of questionnaire with students' responses

Responses n=62 Questions	Dissection	PowerPoint presentations	Combination of both	None
Superior tool of understanding	12 (19.4%)	3 (4.8%)	46 (74.2%)	1 (1.6%)
Makes learning interesting	19 (30.6%)	9 (14.5%)	32 (51.6%)	2 (3.2%)
Provides 3 dimensional perspective	19 (30.6%)	16 (25.8%)	25 (40.3%)	2 (3.2%)
Helps in recalling	15 (24.2%)	20 (32.3%)	25 (40.3%)	2 (3.2%)

Discussion

Learning of anatomy based on dissection and interaction with cadavers has the utmost importance and is necessary for the better perception and apprehension of the subject⁷ It not only improves understanding at undergraduate level but also facilitates in postgraduate studies.⁸ But due to scarcity and non availability of cadavers the aspiring surgeons of medical schools are not likely to get much practical experience and at the same time they are unable to perceive the subject in a better way. Since technology has provided us many new techniques to impart education, use of multimedia resources in educational setup can overcome many deficiencies. Multimedia technology provides a rational way to endorse learning in medical students.⁹ This study was designed keeping in view the progressive shortage of cadavers and involvement of computer assisted learning in many aspects of health education. The comparison of overall performance and passing status of two groups of students exposed to dissection and PowerPoint presentations (with images and animations) projected through multimedia respectively showed statistically insignificant results. There is no documentation of any previous study based on the same design. However, different studies have been documented where dissection was compared with other teaching methodologies. In a follow up comparative study, Nnodim et al¹⁰ compared two groups of students exposed to dissection and **prosections** (demonstration with **predissected** specimens) and found no significant difference between the numerical scores of their assessments. In another study comparing personal dissection with peer teaching, ANOVA and multiple range tests showed no significant difference between the scores of students.¹¹ When inquired, several anatomists employed at higher educational institutes endorsed several methods of teaching anatomy including dissection, help of **prosected** specimens, computer aided learning etc, however, preferring dissection more than others.¹² The results of these studies and the current research endorse the fact that alternate methods of learning the gross anatomy can be adopted instead of or in addition to conventional methodology of dissecting the cadavers. This can go in

line with increasing scarcity of cadavers for this purpose. However, comparisons of means of written with viva voce marks within groups provided an interesting insight. Where the students facilitated by demonstrations and dissection performed in both forms of assessments without any statistically significant difference, the means of marks of viva voce were significantly less than those of written exams in case of group II which was facilitated by demonstration with powerpoint presentations projected through multimedia. "A short guide to oral assessment" gives several reasons for assessing orally. It states that this format of assessment reflects the world of practice, improves learning and helps to ensure academic integrity.¹³ Viva voce is used to assess essential practice skills needed for solving clinical problems along with defending professional decisions and articulating rationales for interventions.¹⁴ All these skills are essential for medical profession and need to be inculcated in future doctors right from initiation of their training in first year. The results of current research suggest that dissection helps the students in achieving same level of skills needed for written and oral expression, whereas those students who are not exposed to dissection face a difficulty in developing indepth understanding necessary for skill of good oral expression. This is in accordance with a survey conducted on first and second year medical students where they agreed that deepening of understanding of anatomical structures in a three dimensional perspective through dissection helped them in recalling what they have learnt.¹⁵ A further endorsement of the same is provided by a previous study where medical students in Poland belonging to different parts of the world preferred the use of dissections and **prosected** specimens and acknowledged its effectiveness over atlases, plastic models, or CD-ROMs and multimedia tools to study Anatomy.¹⁶ However, an alternate inference could be drawn from the same statistical comparison where students of group II obtained significantly more marks in written test than viva voce. Exposure to powerpoint might have enhanced the foundation of their theoretical understanding of the subject than oral expression. Although the students of each group were facilitated by only one methodology during the study, they were exposed to both in the tenure of first substage. This coupled with their previous exposure to the powerpoint during lectures on embryology, general anatomy and they had received, they were well aware of both methods, consequently they could comment on effectiveness of this tool when inquired through the questionnaire. In this study, when a questionnaire devised to discern the perception of students towards anatomy learning methodology was floated, majority of students were of the opinion that a combination of both

tools has the potential to improve various aspects of learning gross anatomy.

The medical students and professionals alike put a great emphasis on gross anatomy dissection course¹⁷ which leads to an improvement of surgical applications¹⁸, but its education has transformed enormously in the last decade. A variety of study modules, learning strategies and teaching tools have emerged as a replacement of traditional methodology of teaching anatomy by lectures and dissection of the body.¹⁹ A variety of electronic resources for acquiring knowledge of anatomy is currently available but only a few offers a more comprehensive framework that could complement practical tuition in anatomy.²⁰ As the importance of dissection can not be underestimated, any change in the curriculum, teaching hours and teaching methodology (replacing the conventional with modern teaching tools) should be done with extreme care and after a thorough consideration of consequences.

Even though the study was performed in only one medical college due to limited time and resources but the study centre mirrors typical Pakistani settings of medical colleges and measures recommended here should be applied to all. Sample size also appears to be small which may be the probable reason of insignificance in results among the two groups. Future research directions include involvement of larger groups of students.

Conclusion

In conclusion it is suggested that in order to develop same level of skills needed for written and oral expression, role of cadaveric dissection in anatomy learning seems indispensable. However, projection of images and animation through PowerPoint can act as a factor in improving the aspects of perception and cognition in the training program especially theoretical knowledge. Thus by combining the two modes of learning (as endorsed by an insignificant difference between the outcomes obtained by two methods), good quality future professionals will be produced with better knowledge of human body. Keeping in view the reality that anatomy is a multi-modal activity, it is suggested that allocated hours should be revised and increased in order to accommodate different teaching methodologies during an academic year.

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