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

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 Chi².

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

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.\textsuperscript{4} Elizondo-Oman a et al\textsuperscript{5} 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 training \textsuperscript{6} 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. Students of group II showed much more enthusiasm in learning and found the material more enjoyable and easier to understand.

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).
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 subject. It not only improves understanding at undergraduate level but also facilitates in postgraduate studies. 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. 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 al 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. 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. 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

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

<table>
<thead>
<tr>
<th>GROUPS</th>
<th>Means of Collective marks±S.D.</th>
<th>*P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>I n=30</td>
<td>54.27±15.38</td>
<td>0.698</td>
</tr>
<tr>
<td>II n=32</td>
<td>55.69±13.27</td>
<td></td>
</tr>
</tbody>
</table>

* = P value computed by independent sample t test

Comparison of students on the basis of their passing status was carried out using Chi ² 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

<table>
<thead>
<tr>
<th>GROUP</th>
<th>Passing Status</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Fail</td>
</tr>
<tr>
<td>I n=30</td>
<td>10</td>
</tr>
<tr>
<td>II n=32</td>
<td>10</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Responses</th>
<th>Dissection</th>
<th>PowerPoint presentations</th>
<th>Combination of both</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superior tool of understanding</td>
<td>12 (19.4%)</td>
<td>3 (4.8%)</td>
<td>46 (74.2%)</td>
<td>1 (1.6%)</td>
</tr>
<tr>
<td>Makes learning interesting</td>
<td>19 (30.6%)</td>
<td>9 (14.5%)</td>
<td>32 (51.6%)</td>
<td>2 (3.2%)</td>
</tr>
<tr>
<td>Provides 3 dimensional perspective</td>
<td>19 (30.6%)</td>
<td>16 (25.8%)</td>
<td>25 (40.3%)</td>
<td>2 (3.2%)</td>
</tr>
<tr>
<td>Helps in recalling</td>
<td>15 (24.2%)</td>
<td>20 (32.3%)</td>
<td>25 (40.3%)</td>
<td>2 (3.2%)</td>
</tr>
</tbody>
</table>
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Anatomy. However, an alternate inference could be understood of the subject than oral expression. It might have enhanced the foundation of their theoretical written test than viva voce. Exposure to powerpoint students of group II obtained significantly more marks in drawn from the same statistical comparison where they had received, they were well aware of both during lectures on embryology, general anatomy and exposed to both in the tenure of first substage. This only one methodology during the study, they were

Although the students of each group were facilitated by 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 course which leads to an improvement of surgical applications, 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. 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. 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.

References
