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TEACHING METHODOLOGY OF ANATOMY: A MODERN OUTLOOK

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ABSTRACT

Traditionally sole pedagogy of gross anatomy has been through cadaver dissections and didactic lectures. However increased access to recent technologies, have prompted many universities and colleges to redefine the teaching methods thus effectively impart the knowledge of gross anatomy.

Aim: To compare the traditional teaching method versus modern teaching method and evaluate their effectiveness in learning gross anatomy.

To assess the degree of student's satisfaction of learning with the above said methods.

Material and Methods: A prospective study was carried out among the freshman undergraduate medical students of Gandhi medical college, Andhra Pradesh, India.

The students of the Experimental group were taught using power point lectures and computer based dissection visuals, along with the traditional method of teaching.

The Control group students were allotted the same number of dissection and lecture hours as the experimental group and followed the same pattern of dissection. The students of this group were taught by using traditional Chalk & Board lectures only. They had no access to power point lectures and computer based dissection visuals. Student's performance was evaluated using multiple choice questions and a feedback questionnaire,

Results: Experimental group Students performed better than the traditional group. i.e. in 2009, four out of six examinations and in 2010, five out of six examinations, experimental group's average scores were significantly higher ($p < 0.05$) than the traditional group. The difference in the averages, between the two groups, was significant, i.e. $Z > 1.96$.

Keywords: Cadaver dissections; Chalk & Board; power point lectures.

INTRODUCTION

Anatomy has always been a cornerstone in medical education¹. It is an undisputed fact that the comprehensive knowledge of anatomy plays a vital role in proper understanding of any other branch of Medicine. It plays an important role in the process of training medical professionals and thereby ensuring safe medical practices.

Traditionally sole pedagogy of gross anatomy has been through cadaver dissections and didactic lectures¹. However increased access to recent

technologies like 3-dimensional audio visuals, digital radiological imaging, and web based study materials etc. have prompted and challenged many universities and colleges to redefine the teaching methods thus effectively impart the knowledge of gross anatomy.

The purpose of the present study is

1. To compare the traditional teaching methods versus modern integrated teaching method and evaluate their effectiveness in learning gross anatomy.

2. To assess the degree of student's satisfaction of learning with the above said methods.

MATERIALS AND METHODOLOGY

Freshman undergraduate medical students joining Gandhi medical college, Andhra Pradesh, during the years of 2009 – 2010 and 2010 – 2011 were considered for the study.

Regular teaching pattern:

In the regular course of teaching, teachers use traditional chalk and board as the main tool of teaching apart from the dissection. Occasionally depending upon the topics dealt and availability of other resources, overhead projectors, specimens, models and power point presentations were also used.

Participants' selection:

One hundred and fifty (N=150) freshman medical students entering Gandhi medical college, in the order of their merit in the Common Entrance Test, are arranged in alphabetical order of their names and divided into four groups consisting of $n_1=38$, $n_2=38$, $n_3=37$ and $n_4=37$ number of students respectively. Each year, out of four, two groups were chosen randomly for the study, one as an Experimental and the other as Control, with a prior informed consent.

Design of the study:

Topics selected for the study were Upper extremity and Thorax. While teaching the Experimental group students, computer based dissection visuals prior to the dissection lab and power point lectures were integrated into the traditional method of teaching.

The Control group students were allotted the same number of dissection and lecture hours as the experimental group and followed the same pattern of dissection. The students of this group were taught by using traditional Chalk & Board only.

Students of the both the groups were regrouped into batches of 7-8 students, per cadaver. They were allowed to undergo regular teaching through dissection, as per the university guidelines in accordance with Medical Council of India regulations.

EVALUATION

Both the Experimental and Control groups were tested with the same pattern of examinations. Students were given total 6 sets of multiple choice question examinations for both the topics i.e. Upper limb 3 questionnaires and Thorax 3 questionnaires, at regular intervals within the stipulated time period.

At the end of study a feedback questionnaire was distributed to both the groups. The purpose of the questionnaire was to assess the efficacy of the recent methods used in the study, the students' overall satisfaction of learning with the traditional versus modern method of teaching and further suggestions regarding the future improvement and implementation of the newer method.

Averages in the test scores, Z – Test values and feedback observations were depicted in tables 1 and 2. The results were analyzed statistically.

STATISTICAL ANALYSIS OF THE TEST SCORES:

Test scores of the Control and Experimental group were compared for each topic. The differences in the averages obtained between the two groups, for each test, were assessed for any significance.

As the sample size was more than 30 ($N > 30$) and equal for both the groups, Z-Test was conducted, to assess the significance in average differences between the Control and Experimental groups. The level of significance was set by ' p ' value i.e. $p > 0.05$ is non- significant and $p < 0.05$ is significant. Z-test value greater than 1.96 is considered significantly different between the averages.

The average scores and the Z-test and ' p ' values are depicted in the (Table – 1)

Data analysis:

Upper Extremity & Thorax – 2009;

In initial examination for both the topics, results did not show any significant difference in average marks between Control and Experimental groups. Whereas the latter two examinations showed higher average marks in Experimental group.

Upper Extremity & Thorax – 2010;

The initial examination in upper extremity did not show any significant difference in average marks between Control and Experimental groups. Whereas in all the other examinations results showed higher average marks in Experimental group.

Analysis of the feedback data:

Results of seventy two out of seventy four completed and returned questionnaires show that the computer based dissection visuals and power point lectures were excellent tools to understand and learn gross anatomy. All the students participated in the study felt that the modern integrated method made the subject of anatomy easy and more interesting. Finally students suggested that the use of modern teaching methodology in future would certainly improve the future of anatomy education.

DISCUSSION

Small group learning is considered to be superior method of learning², but in India due large numbers of student intake in medical colleges, lecture methods are more preferred and will continue to be put into practice. In order to cater to the needs, the lectures should be made more effective.

The review of literature showed that combination of various teaching methods i.e. cadaver dissection, didactic lectures, computer mediated instruction and web based anatomy materials, together yielded better results in learning anatomy. In individual studies by Biasutto SN, et al³, Boucher, et al⁴, Elizondo-Omana, R. E, et al⁵, Granger NA, et al⁶, Jose A Pereira, et al⁷, Dana J. Jamero, PharmD, et al⁸, and Forester JP, et al⁹ M Thomas, et al¹⁰, it was observed that, either combination of the newer technological resources with traditional methods yielded better results or newer methods became viable alternative to traditional methods.

Nobert A. Jones, et al¹¹, Walsh, R. J. and Bohn, R. C¹², Bukowski EL¹³, Dobbins C, et al¹⁴ and Mc

Nulty J A, et al¹⁵ in their studies, compared traditional dissection cum didactic lecture method of teaching with the new multimedia and web based methods. Except in the study of Mc Nulty JA, et al¹⁵, all the other studies' results showed that the newer methods are better appreciated by the students than the traditional teaching method.

Likewise in the present study also, power point projections and computer based dissection visuals when added to the regular teaching method yielded better results than when used alone.

In almost all the studies, by Azer SA, Eizenberg N¹⁶, Patel KM and Moxham BJ¹⁷, Vikas Seth, et al¹⁸, Walsh, R. J. and Bohn, R.C¹¹, Ganger, et al⁵, Jose A Pereira, et al⁶, , Dobbins.C, et al¹³, Dana J. Jamero, PharmD, et al⁷, where the feedback was taken to assess the degree of student satisfaction of learning with the recent advanced methods of teaching, students were of the opinion that either the new media were better than the traditional methods or at least as effective as traditional method in learning human gross anatomy.

Possible reasons for the better results with newer method than the traditional method:

The following observations could be made out for the students' better performance with the newer method.

1. Incorporation of Audio-Visuals, animations, pictures in the power point lectures, made it more interesting and informative to the students.
2. Most of the anatomy diagrams are difficult to understand in 2-dimensional mode on the chalk and board, but the audio-visual can give a better concept of the subject and long lasting impact on the students.
3. Dissection visuals shown prior to the dissection lab, made the students better prepared for the dissection which eventually helped them in getting good scores in the examinations.
4. As integration of the newer method with the traditional chalk & board, was well managed the students were able to interact with the

teacher and also take down notes and the diagrams when needed.

5. The reasons for the continual improvement in the students' performance in both the groups in consecutive exams, however, might be attributed to the regular examinations conducted as a part of the study and gradual exposure of the subject made the students better prepared.

In view of the reduced total teaching time, addition of newer tools to the regular teaching will help the teacher to cover the topics within the stipulated time period with better quality. Eventually, improving the students' performance, satisfaction of learning and as a whole quality of health education.

LIMITATIONS

As university regulations demand cadaver dissection, comparison to find out whether dissection can be completely replaced with modern methods of teaching, cannot be considered for the present study.

This study included smaller groups (n=38) of students. Results of the less sample size may not be applicable for the larger group students in view of the differences in the student's attention and receptivity in larger group settings.

Utility of power point lectures not only depends on the lecture itself but also on the various factors like availability of electricity, students' personal preferences, teacher's capabilities (in integrated method) to deal with the technology, subject quality, time management and interaction with students at the same time and trained technical staff to take care of the available resources etc...

CONCLUSION

It is opined that whatever the method of teaching aids used, the impact of the lecture mainly depends on the lecturer. However it is understood from various studies on teaching methodologies that the proper utilization of newer technologies along with the traditional teaching methods will

certainly lead to better understanding of gross anatomy and will eventually improve students' performance. But, until studies prove these possibilities on larger sample sizes, we cannot jump to such conclusions. In view of the poor literature availability in the context of Indian medical education, this study, in its own little way, may add up to it.

Consent:

A prior informed consent was taken from the students that participated in the study.

Competing Interests:

The authors declare that we have no competing interests

Ethical committee clearance:

As the study did not include any tests of significant importance on the subjects involved in the study, ethical committee clearance was not taken into consideration. Authors will take the responsibility of any further allegations regarding ethical clearance that arise from the study.

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Table: 1 Average scores, Z-test and 'p' values of the experimental and control group students:

| S. No | TOPIC | Exam | AVG (Control) | AVG (Exp) | 'Z' and 'p' values |
|-------|-----------------|------|---------------|-----------|---------------------------|
| 1 | Upper limb-2009 | I | 16.08 | 16.81 | Z = 0.78, $p > 0.05$, NS |
| | | II | 16.27 | 18.0 | Z = 2.03, $p < 0.05$, S |
| | | III | 15.95 | 18.24 | Z = 2.60, $p < 0.05$, S |
| 2 | Thorax-2009 | I | 16.30 | 17.32 | Z = 1.80, $p > 0.05$, NS |
| | | II | 16.68 | 18.05 | Z = 2.04, $p < 0.05$, S |
| | | III | 16.97 | 18.78 | Z = 2.76, $p < 0.05$, S |
| 3 | Upper limb-2010 | I | 15.76 | 16.95 | Z = 1.35, $p > 0.05$, NS |
| | | II | 16.10 | 17.74 | Z = 2.19, $p < 0.05$, S |
| | | III | 16.29 | 18.55 | Z = 3.05, $p < 0.05$, S |
| 4 | Thorax-2010 | I | 16.39 | 17.89 | Z = 2.34, $p < 0.05$, S |
| | | II | 16.18 | 18.26 | Z = 2.70, $p < 0.05$, S |
| | | III | 16.39 | 18.84 | Z = 3.5, $p < 0.05$, S |

S. No = Serial number

AVG (Control) = Average marks of the *Control group*.

AVG (Exp) = Average marks of the *Experimental group*.

S = Difference in the averages is Significant between the two groups

NS = Difference in the averages is Not-significant between the two groups

Z = Z - test value, **p** = 'P' value.