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Original article

A comparative study of effectiveness of cadaver dissection versus computer assisted dissection

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ABSTRACT

Introduction: The aim of this study was to compare the effectiveness of computer assisted virtual dissection with that of actual dissection as analyzed through students' achievements and attitudes.
Methods: We conducted a prospective inferential study with fifty 1st year medical students who undertook dissection classes through computer – assisted dissection, actual dissection on cadavers and combination of both in three different sessions. The students' scores in the assessment tests after undergoing these dissection schedules were analyzed using paired *t*-tests. Students' attitudes regarding these two methodologies were assessed by a set of questionnaire.
Results: Students who participated in the actual cadaver dissection, supplemented by computer assisted virtual dissection scored significantly higher ($p = 0.004$) as compared to any of dissection methods used alone on post-dissection assessment tests. The proportion of students achieving more than 50% marks was also significantly higher with the combination method. Analysis of the survey questionnaire indicated differences in attitudes of students for actual dissection and computer-simulated virtual dissection. Vast majority of students (97.6%, n = 48) stated that computer assisted dissection cannot replace the actual dissection of cadavers, but were in the favor of incorporating the computer assisted virtual dissection as an integral part of teaching of human anatomy as a complementary tool to the actual dissection.

1. Introduction

The study of anatomical details of the human body has been a cornerstone in medical education all across the globe since ages.[1] Anatomy and dissection have long been considered the foundation of medical education. The use of human cadavers as a learning tool has been in practice ever since Andreas Vesalius started dissecting the cadavers in 1514.[1,2] Several Authors have advocated that the dissection of cadaver gives students a better appreciation of the three-dimensionality of the human body and better understanding of variations in human anatomy.[3–7] Medical students not only connect to the human body in a better way but also develop a feeling of empathy which is essential for a future doctor to develop.[8] In different studies authors have advocated better performances and peer interaction by students exposed to actual dissection of cadavers as compared to the students that had no contact with the cadaver.[9–11] However, many of the recent authors emphasize upon the virtual methods of dissection and favor modern computer based teaching arguing that the actual dissection of cadaver is a story of the old days. Their studies reported many advantages to students that had a non- cadaver based study than the students that carried out dissection.[12–18]

Different authors have used either post-training evaluation tests or questionnaire method to assess the effectiveness of the actual and virtual dissection in separate group of students and have contributed to the debate.[19–23] However the evidence generated by the combination of post-training evaluation tests and questionnaire method is lacking in the available literature. In this study, we have tried to sort out the issue through a combination of assessment tests conducted after training and a questionnaire filled by the students. The questionnaire would gather information regarding students' opinion and perception on the use of computer assisted virtual dissection, as compared to the traditional dissection of cadavers in learning gross anatomy. The purpose of

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the study was to find out which type of dissection training was better for the students in enhancing the learning and reproduction of knowledge as assessed through scores in exams and correlate the objective and subjective data.

2. Material and methods

This was a prospective, inferential study conducted in the Department of Anatomy of All India Institute of Medical Sciences (AIIMS), Rishikesh. The institutional ethics committee approved the study protocol. Fifty, first year medical students participated in the study after giving informed consent. The study was performed in three sessions of six weeks each (Fig. 1). In the first session, the anatomy of superior and inferior extremities were taught without actual dissection of cadavers with the help of dissection videos of respective regions and online medical animations during the practical hours, supervised by the teachers who tried to emphasize on the most important aspects. The actual dissection for these extremities was performed after the assessment test to maintain their level of understanding. In the second session, the students studied anatomy of abdomen and thorax through actual dissection on cadavers, assisted by the teachers. In the final session, the students carried out actual dissection on the regions of head, neck and brain as well as visualized the dissection videos of these regions. The videos of dissection were, provided to them in pen drives also. The learning and understanding of the subject by the students after each session were evaluated by assessment tests that included objective multiple-choice questions, which were recall based, comprehension based and application based.

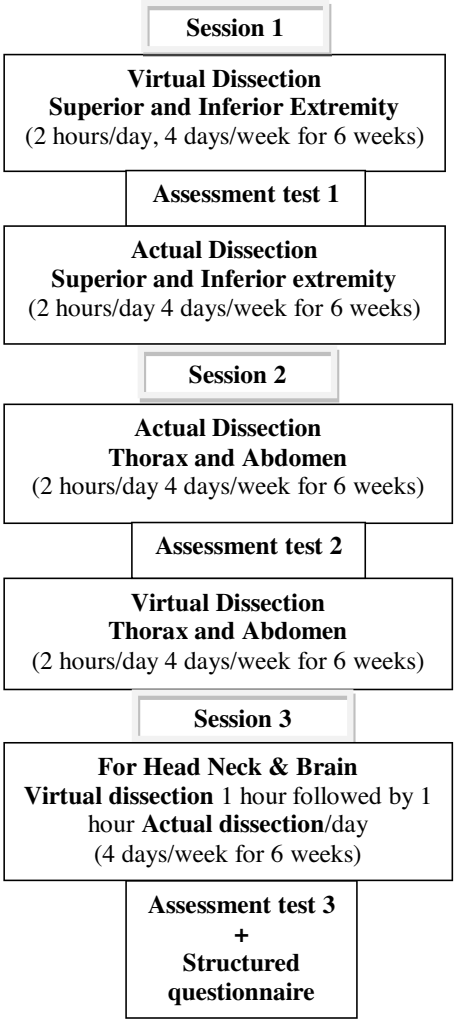

Fig. 1. Flowchart showing research methodology.

Mean scores were calculated after each test session. Significance of difference between scores of different sessions was evaluated by paired *t*-test, using computer program Microsoft Excel Data Analysis Tool Pack. To find out the significance of difference in the ratios of the students who passed in tests to the failed students (i.e. obtaining less than 50% of marks), Chi square test using Epi Info software was applied. *p* values of less than 0.05 were considered statistically significant. The students also filled up a structured questionnaire where in they reported about their perception about virtual, actual and virtual + actual dissection sessions. Frequency of responses of questionnaire was assessed to know the attitudes of students towards both the methods of dissections.

3. Results

The mean score of the evaluation test performed after first session was 53.00 ± 11.91, after second session was 54.06 ± 9.83 and after final session was 58.82 ± 7.68 (Table 1). Comparison of the mean scores of virtual and actual dissection training evaluation tests with paired *t*-test showed no significant difference ($p = 0.58$). However, there was a significant difference between mean scores of virtual and virtual + actual dissection training assessment tests ($p = 0.004$), and between actual and virtual + actual dissection training evaluation tests ($p = 0.008$). This clearly shows that the combination of traditional and virtual dissection techniques show better results than any of the techniques practiced alone.

It is notable that 64% (n = 32) students passed in assessment test after actual virtual training, 68% (n = 34) students passed in assessment test after virtual training and 88% (n = 44) passed assessment test in the combined training program.

3.1. Statistical analysis

On statistical analysis of the results,in terms of percentage of students scoring 50% or more marks, in the assessment tests by applying Chi Square test, it was found that the pass-fail ratio was significantly better when actual and virtual dissection training was used hand in hand (p = 0.01) rather than, when these techniques were used alone (Table 2).

The subjective assessment of the teaching modalities was done through the questionnaire filled in by the students revealed that majority (66%, n = 33) of the students had agreed to the fact that combination of the two methodologies of dissection has a greater impact on their learning. Most of the students (56%, n = 28) felt that combination method made the subject interesting as compared to either of the dissection methodologies practiced alone. It was however, seen that equal number of students (40%, n = 20) found

Table 1
Comparison of scores in assessment tests after virtual, actual and actual+ virtual dissection.

Type of dissection	Mean ± Standard Deviation	*p* value
Virtual versus Actual dissection		
Virtual	53.002 ± 11.91	0.58
Actual	54.06 ± 9.83	
Virtual versus Actual + Virtual dissection		
Virtual	53.00 ± 11.9	0.004
Actual+ Virtual	58.82 ± 7.68	
Actual versus Actual + Virtual dissection		
Actual	54.06 ± 9.83	0.008
Actual + Virtual	58.82 ± 7.68	