# A comparative study of learning with "anatomage" virtual dissection table versus traditional dissection method in neuroanatomy

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## Abstract

**Background:** Dissection of cadavers has been the main teaching learning method to learn human anatomy in medical education over the years. Newer teaching learning tools have come up with the advancement of information technology. Many computer-based interactive multimedia learning modules and virtual visualization soft wares are available now. Present study was undertaken to compare the learning with "Anatomage" virtual dissection table versus learning with traditional dissection in neuroanatomy. Student's perception in regards to utility of "Anatomage" virtual dissection table in learning neuroanatomy was also obtained.

**Materials and Method:** A randomized cross sectional prospective study was conducted on 122 medical students of 1st year. Students were divided into two groups A and B. Group A studied "internal capsule, basal ganglion and spinal cord" by using "Anatomage" virtual dissection table. Group B learnt through traditional dissection method. Pre and post-tests were conducted for all groups with pre validated questionnaire. Feedback was obtained from students through a 5 point Likert scale. Students' t test was applied for statistical analysis.

**Result:** There was no statistically significant difference in gain of knowledge in group A students in comparison to group B students. 51% students found that use of "Anatomage" virtual dissection table helped them understand topic better and majority (79%) felt that it enhanced their class room experience.

**Conclusion:** "Anatomage" virtual dissection table as a teaching -learning method is as good as traditional dissection to learn neuroanatomy. Teaching-learning with "Anatomage" virtual dissection table facilitates 3D visualization of structures and their relations. It enhances class room experience of learners. It could be included in medical undergraduate curriculum as a teaching tool to facilitate learning.

**Keywords:** Anatomage, Virtual dissection table, Traditional dissection, Learning anatomy, Virtual dissection.

## Introduction

Anatomical teaching has been centred around dissection of cadavers for centuries. Anatomy education has evolved through dissection of cadavers to study of prosected and plastinated specimens, to more active learning, through web-based and computer-based interactive multimedia learning modules and virtual visualization softwares.[1] Ramsey-Stewart G et al[2] conducted a study on senior medical students in Sydney and concluded that dissection anatomy should be an integral component of medical education. Azer S, Eizenberg N.[3] observed in their study that use of multimedia did not change students' perception regarding importance of dissection in learning anatomy. Students also agreed that dissection deepened their understanding of anatomical structures, provided them with a three-dimensional perspective of structures and helped them recall what they learnt. Virgil Mathiowetz et al[4] compared anatomy laboratory teaching versus online anatomy software and observed that the students who attended anatomy laboratory scored higher than students who attended online anatomy learning program. Custer T, Michael K[5] observed in their study that "Anatomage" virtual dissection table is a beneficial learning tool in view of imaging science students. Winkelmann A.[6] reviewed 14 studies comparing different teaching approaches including dissection, prosection and online computer based teaching aids. There is no evidence that any one method is superior to teach anatomy.

Present study was undertaken to compare the learning with "Anatomage" virtual dissection table versus learning with traditional dissection in neuroanatomy. Perception of students in regards to utility of "Anatomage" virtual dissection table was also obtained.

## Materials and Method

A randomized cross sectional prospective study was conducted after due permission from IEC and obtaining consent from students. Internal capsule, basal ganglion and spinal cord were taken as topic of learning.

122 students of 1st year MBBS class of Gujarat Adani Institute of Medical Sciences, Bhuj participated in the study. Students were randomly distributed in two groups A and B. Each group consisted of 61 students. Both groups A and B had three sessions of lectures of one hour each on three consecutive days. Each lecture was followed by a practical session of one hour. Group A learnt internal capsule, basal ganglion and spinal cord with the help of "Anatomage" virtual dissection table

during practical hours (Fig. 2). Group B was exposed to specimens and performed dissection to learn internal capsule, basal ganglion and spinal cord during practical session. Both groups were given 1 hour period for self-study before conducting post-test on the last day.

Pretest and post-test were given to all students. Pre and post-tests consisted of pre validated 20 single correct answer type MCQs. All questions were validated for construct validity by four faculty members of department of anatomy.

After post-test group B was exposed to "Anatomage virtual dissection table for learning and group A was exposed to specimens and dissection for 3 hours. A questionnaire was given to each group to get the feedback from students. It was in the form of Likert's 5 point scale 1. Strongly disagree, 2. Disagree, 3. Neutral, 4. Agree and 5. As strongly agree.

Statistical analysis was done on the data obtained with the help of Microsoft excel software to find out the median, mode and standard deviation; student t test was applied to find out any significant difference in the marks. Significant p value was taken as $<0.05$.

## Results

**Table 1: Mean marks obtained by students of group A, and B in pretest and post-test and standard deviation. p value of pre and post-test**

| Group | Pre test- Maximum Marks=20 | | p value- Pre test | |
| | Mean Marks | Standard deviation | Comparison between group | P value |
|---|---|---|---|---|
| A | 7.16 | 2.06 | **A and B** | 0.3150 |
| B | 6.80 | 2.85 | | |
| | **Post test -** Maximum Marks=20 | | **p value- Post test** | |
| A | 12.5 | 1.86 | **A and B** | 0.0979 |
| B | 11.73 | 2.49 | | |

**Table 2**: **Comparison of obtained mean marks in pre and posttest within each group**

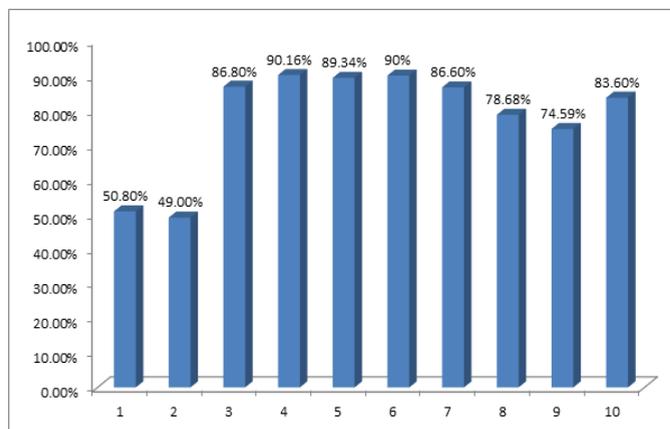| Group | Pre test Mean marks | Pre test Standard deviation | Post test Mean marks | Post test Standard deviation | Comparison of obtained mean marks in pre and posttest (p value) |
|---|---|---|---|---|---|
| A | 7.16 | 2.06 | 12.5 | 1.86 | <0.0001 |
| B | 6.80 | 2.85 | 11.73 | 2.49 | <0.0001 |



**Fig. 1**: **Students response >3 on Likert's scale (Table 3)**

**Table 3: Students' reaction obtained on Likert's scale (Fig. 1)**

| S. No. | Reaction of Students to following statements on Likert's scale |
|--------|-------------------------------------------------------------|
| 1 | Use of "Anatomage" virtual dissection table has helped me to understand the topic better. |
| 2 | Prosections (dissection) have helped me to understand the topic better. |
| 3 | I developed deeper understanding of the topic with use of Anatomage along with prosections (dissection). |
| 4 | Anatomage helped me to understand different parts of brain and spinal cord in 3D image. |
| 5 | Anatomage helped me to visualize better the relative sizes of different parts of brain and spinal cord. |
| 6 | Anatomage helped me to understand relationship between different parts of the body systems. |
| 7 | I enjoyed the whole process of using Anatomage. |
| 8 | Use of Anatomage enhanced my learning experience and interest in studies. |
| 9 | Learning with Anatomage virtual dissection takes less time than traditional learning with prosections (Dissection). |
| 10 | Anatomage virtual dissection table should be included in routine teaching learning process. |



**Fig. 2: Students using "Anatomage" virtual dissection table to learn neuroanatomy**

### Discussion

Dissection helps in identification of structures along with tactile information on tissue texture. It provides kinesthetic aspect of learning with 3D visualization of structures. Once any structure is cut or damaged during dissection, it cannot be reconstructed hence, dissection is irreversible in nature. Virtual models or dissection tables are alternative useful teaching learning tools. "Anatomage" is a virtual dissection table that allows students to isolate different structures in 3D form, dissect, reconstruct, zoom in and out, transecting them in order to appreciate anatomical form and relationships. Pausing, rewinding and revisiting different structure and systems by creating presets in virtual dissection table is a unique feature that helps to provide personalization to the learners.[5]

Present study was intended to compare learning with "Anatomage" virtual dissection table versus traditional dissection method. A statistically significant difference was found between mean marks obtained in pretest and post-test of group A. The p value for the mean marks obtained was calculated as <0.0001(Table 2). In group B, the p values for marks obtained in MCQs test were calculated as <0.0001 in pre and post-tests (Table 2). It shows that there is significant gain of knowledge in both groups. Hence, traditional dissection and "Anatomage" virtual dissection table both facilitate learning.

No statistically significant difference was found between learning with "Anatomage" virtual dissection table, group A and learning with traditional dissection method, group B. The p value was 0.0979 (Table 1). Mean marks obtained in post-test by group A were 12.5. Mean marks obtained by group B were 11.73 (Table 1). Hence, results show almost the same academic performance with use of "Anatomage" virtual dissection table as well as traditional dissection method as learning tools in neuroanatomy (Table 1). Previous study, by Custer T, Michael K[5] conducted on medical imaging students in regards to utilization of "Anatomage" virtual dissection table observed that students appreciated learning with the Anatomage

Table and believed that the Table is a beneficial and effective tool in preparing them to enter a health care profession. No other similar study available to compare with.

It has also been shown that when students are offered an alternative to dissection using models and charts, there was no significant difference in their written examination results, compared to students who completed the dissection.[7] Quentin-Baxter and Dewhurst[8] suggested that computer-based simulation materials offer a huge amount of supporting and reinforcing information to learners, and that students can work with them at their own pace.

No statistically significant difference was found in mean marks obtained by Group A and B in pretest questions (Table 1). This suggests that the initial knowledge base of all students included in study was equal for the given topic.

Custer T, Michael K[5] described students' reaction in their study that 94% students agreed with the fact that they were benefited by use of "Anatomage" virtual dissection table in learning anatomy. 88% Students further described the positive influence of "Anatomage" virtual dissection table on class room experience.

In the present study, questionnaire was focused to get students reaction on the understanding of the subject topic, visualization of structures and their relations, time needed to learn a topic with the help of "Anatomage" and their opinion to include it in regular teaching learning process (Table 3). More than half (51%) agreed that "Anatomage" virtual dissection table helped them to understand the topic better and 87% thought that they developed deeper understanding of the topic with the help of use of "Anatomage" and prosections both. Majority (55%) enjoyed using "Anatomage" virtual dissection table as teaching learning tool (Fig. 1). Most students (89%) could visualize relative size of different parts of brain and spinal cord better (Fig. 1). 90% found that "Anatomage" virtual dissection table helped them to visualize relations of different parts better. Majority(79%) agreed to the fact that "Anatomage" virtual dissection table enhanced their learning experience and (75%) agrred that use of virtual dissection table consume less time to understand structures. 84% students were in favour of including "Anatomage" virtual dissection table in regular curriculum as teaching tealing tool.

Students' reaction in present study also confirms views expressed in previous study that "Anatomage" virtual dissection table helps in developing deeper understanding and enhance class room experience.

## Conclusion

"Anatomage" virtual dissection Table, a new teaching learning tool facilitates 3D visualization of structures and their relations. Learning outcome with "Anatomage" virtual dissection table is as good as learning with traditional dissection in neuroanatomy. It enhances class room experience of learners. It could be included in medical undergraduate curriculum as a teaching tool to facilitate learning.

## Conflicts of interest

The authors have none to declare.

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