Original Article

The Analysis and Visualization of 3 Dimensional Dissection Table in Anatomy Teaching in Cross-Section Images as Per Student's Perspective

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ABSTRACT

Objective: To find student's perception in relation to the anatomy learning with 3D visualization of whole human body.

Study Design: Prospective cross-sectional study

Place and Duration of Study: This study was conducted at the Department of Anatomy, Jinnah Sindh Medical University, Karachi from August 2019 to February 2020.

Materials and Methods: The study was conducted after 4 weeks of teaching on spectra 3D visualize Table of 1st year MBBS students of Jinnah Sindh Medical University (n=120). After the period of teaching, a questioner of closed-ended questions was filled by the student and frequency was calculated on those responses. Chi-square was applied for the demographic data to assess the student perspective.

Results: 73.4% of the population was agreed on that it is an easy mode of learning and 62.5% and 71% were agreed that they gained spatial knowledge of cross section viscera thru this table, 50% students were agreed that the 3 D images were adequately appreciated regarding the regional anatomy, most of the students felt motivated while using this technology

Conclusion: 3D image and touch technology will help the student for a better understanding of anatomy teaching and provide an interactive method of teaching. This technology will improve the student learning and knowledge of anatomy.

Key Words: Sectra, visualization, anatomy teaching and cross section image.

INTRODUCTION

Human Anatomy is the study of the Human body grossly, histologically and embryologically. Hence, teaching anatomy is not a piece of cake[1] rather it involves application of various tools ranging from the use cadavers to the use of plastic models.

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Anatomy teaching and learning dates to the era of Aristole. In past centuries, Anatomy teaching was also supported by the different tools as direct observation thru dissection of cadavers, tissue microscopy under light and electron microscope, use of torso and plastic models and by analyzing preserved specimens but unfortunately due to the ethical issues cadavers are unavailable and teaching is relies only on plastic models and multimedia recourses[2].

With the advent of research in the field of Information and Technology, anatomy teaching has become more versatile and comprehensive. 3D anatomical images and 3D visualization of human body has great value in the understanding of spatial anatomical relations[3]. Sectra is a 3D visualization data base software touch table, which includes the human body atlas with dissector, the educational portal (an online updated case from all over the world related to the anatomy and radiological finding that provides a clear picture of these structures and many teaching programmes).[4] Incorporation of three-dimensional printing approaches can provide pedagogic benefits for self-directed learning outside of the anatomy laboratory. The 3D images and their cut sections could be enlarged enough

to visualize clearly and relate the spatial anatomy of these structures.[4] Having identified the potential value of VT3DP for learning in both practical and remote environments, it was important to investigate student perceptions of the impact of the activity on their learning[4]. Sectra 3D visualization table in a innovative technology introduced in Pakistan currently to provide supportive learning in the field of anatomy and its clinical correlation with updated data provided by the Educational portal[5]. The purpose of this study is (1) to define the role of this new technology in anatomy teaching and (2) to obtain the student perception and attitude toward this technology in their current curriculum at our setup that is Anatomy department SMC JSMU.

MATERIALS AND METHODS

The study was conducted in the Department of Anatomy, Jinnah Sindh Medical University. This was a prospective cross-sectional study based on 13 closed questions. The questionnaire was graded according to the Likert's scale from 1-5 starting from strongly agree[1] to strongly disagree[5] The targeted population was students of JSMU enrolled in 1st year MBBS and after 4 weeks of anatomy teaching on Sectra in tutorial session on cross-sectional structures of thoracic anatomy. Total number of students included in the study was 120, calculated according to the open Epi-software system at 95% of confidence interval. The study was conducted before the impact of COVID-19 pandemic.[6] as the teaching was based on face to face session in small and large groups. Students were divided in 4 small groups (40 in each) for the hands on exposure of each student with the 3D visualization table facilitated by the faculty. The Sectra Terminal visualization table, model[5] for the teaching sessions of 2 hrs/ week were scheduled for each group on Sectra 3 D visualization table which included the of cross-sectional interpretation of thoracic images, observation and visualization in detail during the module. They used topographical study of the thoracic cross sectional sessions of thoracic viscera.

By the end of the module, the questionnaire was filled by the participant with their consent to obtain their perception regarding the technology and spatial anatomical concept making. The other small group sessions were also integrated with the usage of plastic models in these tutorial to compare their application in anatomy learning.

The questionnaire was based on constructive theoretical approach, so the content validity of this survey was designed to find out the attitude of student towards this new technology in learning anatomy. The contents of questionnaire were reviewed by three experts to validate this survey and omit unnecessary questions and pilot study was conducted on small population of 15 participants that revealed the reliability of the questionnaires a value of 0. 79 was identified, where a value 0.7-0.9 is considered acceptable [7]

Statistical analysis: The demographic data was tested by the Chi square and the frequencies were calculated for each question on SPSS version 22.

RESULTS

The study was included total 120 students of 1st year MBBS where 45 were males while 75 were female students. The mean age of the participants were calculated 20 years.

The perceptions regarding the utility of the technology in anatomy teaching were observed as:

73.4% students were responded strong agreement on that 3DVT is an easy and effective mode of anatomy learning; while 62.5% were responded positively agreed on that adequate knowledge was gained to understand the anatomy learning on cross sectional visualization Only 32.8% of the participants were responded strongly agreed that this technology was easy to handle while 71.9% of the participants were showed cumulatively agreement on that the Cross sectional mode in 3D visualization was helpful in an understanding of gross anatomy at the cut sections level as compared to the plastic models of torso.

50.0% of the participants were revealed strongly agreement with the perception of adequate interpretations of regional anatomy imaging that will help to learn anatomy on 3D Technology. Only 15.6% of the respondent showed agreed that too many images at the same time on 3D sectra created confusion and created cognitive load in anatomy learning thru 3DVT while rest of the others were adjustable with technology. The responses regarding handling of the images and informations without teacher guidance only 21.9% cumulatively responded agreed and strongly agreed. Only 56.2% of the participants were responded positive agreement regarding the motivation in learning anatomy thru this 3D process technology. 31.2% of the participants were showed agreement with regarding the written information was adequately provided in the 3D Sectra Visulization Table while rest were not appreciated well the enough written matter provided in the table.

48.4% of the students were appreciated that 3D learning on sectra was a helping mode of understanding the spatial anatomical relations. Only 35.9% of the participants were responded strong agreement that touch technology will be helpful in the memorization of the Anatomical relations of the regional structures. Only 17.2% of the participants were perceived that it was time consuming learning process while rest of the participant appreciated the technology was less time consuming for the visualization of the cross sectional anatomical structures.
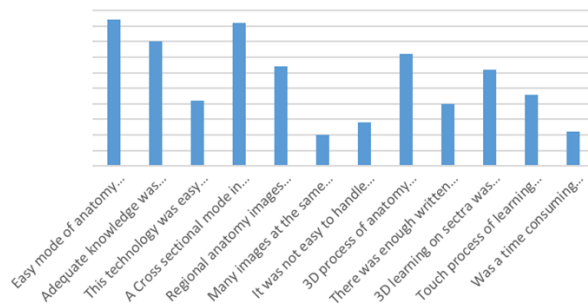
Figure No. 1: Graphical analysis of all questions used for evaluation

Figure No. 2: 3D Sectra Visulization

DISCUSSION

This study based on the students perceptions and experiences by using the 3D Visualization Sectra Imaging table for the spatial anatomy teaching and learning. In Pakistan there are only few medical institutes that have this technology is available especially in Public Sector institutes. The data revealed regarding the student's perception about handling of this technology about 73% students found comfortable and experienced an effective way of learning spatial anatomy especially cross-sectional relationship of the visceras. Literature supported that in another study on VDT (virtual dissection table) was found that overall, students reported a positive learning experience when participating in our integrated virtual cadaveric dissection in the curriculum[8]. It is important for the facilitator to provide appropriate guidance to utilize this technology in their anatomy teaching only but also facilitate them to apply this knowledge in the clinical anatomy learning. This research revealed that more than 62% of the participants gained adequate knowledge of thoracic visceras thru the cross sectional imaging and descriptions as well as 71% were also agreed that it help then in understanding of cross section in the thoracic cavity at different level of cut section as compared to plastic models. Literature supported this as a study reported that this 3D VT intervention in routine

anatomical teaching improved and supported student's concept making and actual appreciation of human anatomy and reported that students were successfully interpreted the gross relationships of vital viscera of thoracic region in cross sectional images[3] Educational portal of Sectra provides online learning resources and open access to the current data relevant to clinical anatomy of that region[5].This mode of learning will help the students to apply their knowledge in clinical scenarios and during their surgical posting help them to plan preoperatively[9]. This study showed 50% of the students strongly agreed on the statement that 3D images of cross-sectional anatomy of thoracic region helped them in making concept formation and interpretation of the regional image relationships. This is supported by a study that cross-sectional 3 D images are important feature of DVT and it helped the students applied this in the clinical interpretations, it was also revealed that DVT provided an educational learning resource that was helpful in their clinical anatomy teaching[10].

Around 32% of the students reported this technology as easy to handle while rest were found it difficult when handle it with guidance of the facilitator while only 21.9% were also reported that this technology not easy to handle the images and information without teacher guidance. Literature suggested wide variation regarding the 3DVT technology handling from easy to difficult in routine teaching and learning of anatomical concepts for undergraduate and postgraduate level[11]. It was suggested that more training and hands on practice is required for the familiarization with this advance technology although is easy learning platform having less effort to learn as well as effective mode to learning[12, 13]. This study showed that only 17.2% of the participants were perceived that it was time consuming learning process while rest of the participant appreciated the technology was less time consuming for the visualization of the cross sectional structures and its memorization is in agreement with the literature that suggested that training and hands on active learning improves the time constraints as well as it was also found that students reported that virtual dissection improved their understanding of the clinical applications of anatomy.[8]

Only 15% of the participants reported that too many images at the same time have created confusion in the learning process while rest of the students were appreciated them well, also perceived that it was very interactive experience and have a high fidelity resource of learning, while 48.4% of the students were appreciated that 3D learning on Sectra 3DVT was a helpful mode of understanding and learning the spatial anatomical relations, the literature supported that there is a strong positive relationship between the anatomy learning and visuo-spatial observations and it was also suggested that delivery of these specific features in 3D

images have enhanced students visual-spatial skill and a previous study investigating a combined visual technology-enhanced approach has identified reductions in cognitive load during student learning of anatomy and concept formation especially in cross section relations of the visceras.[14,15]

It was also reported in this study that 35.9% of the students perceived as the touch technology will be helpful in the memorization of the Anatomical relation of the regional structures this was negated by finding in literature as the data suggested that 3DV technologies showed high factual knowledge that improved student's learning and memorization abilities and integration of these technology is appropriate with pedagogical paradigm shift.[16,17] This might require further clarifications of that this process not only help in the memorization while other process of learning might be helpful. Due to the deficiency of literature in the Pakistani context regarding the 3 DV technology further researches based evidences are required and labeled as an essential tool for anatomical teaching and learning.

Further evidences in this study revealed that 56.2% of the participants felt motivated while using this 3DVT technology for anatomy learning, the literature was found that VR experience of learning was more enjoyable, engaging and student felt motivated while performing the learning activities even in the most difficult concept building like in neurosciences[20]. It is suggested that student' learned more by using the advance technology of 3DVT. Further research is required to determine the perceived evidences of using 3DVT will replace or supplement the cadaveric dissection in applied anatomical teaching.[18]

CONCLUSION

The survey concludes that use of 3D image and touch technology in Anatomy teaching is essential for the comprehensive understanding of anatomyand will surely provide an interactive method of teaching with advance use of technology in the developing country.This evidence based experiences will support the usage of this table in routine medical teaching as supplementary for the anatomy teaching.

Author's Contribution:

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Conflict of Interest: The study has no conflict of interest to declare by any author.

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