The Effects of Hands-on Cadaver Dissection Module on Preclinical Students

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ABSTRACT

Objective: The anatomy education provided by cadaver dissection contributes to the professional skills of medical students. In addition to gaining scientific experiences, dissection practices contribute to the humane approach to the patient, motivation to become a physician, privacy, and ethical issues. Cadaver dissection is one of the oldest methods used in anatomy education, and the moment of encounter with the cadaver significantly affects medical students. The aim of the study was to emphasise the importance of traditional cadaver dissection and raise awareness about body donation.

Methods: The study included 206 preclinical period students. After receiving the dissection materials, the students dissected cadavers, and the instructors helped them throughout the process. After the dissection, we shared an online survey.

Results: 96.6% of the students emphasised that cadaver dissection is important and should be included in the curriculum. Also, 96.6% stated that the dissection module informed them about ethical values. 94.2% declared that dissection increased their interest and motivation towards medical education. 91.8% of the students thought that participation in cadaver dissection provided them with more opportunities to develop professional skills than the demonstration of a prosectioned (previously dissected) cadaver. 71.8 of them stated that the models or computer-assisted education can not replace cadaver dissection.

Conclusion: However, although technology and artificial intelligence facilitate learning, the multifaceted benefits of the cadaver cannot be denied, and the cadaver cannot be excluded from anatomy education.

Keywords: Cadaver dissection, Anatomy education, Cadaver and ethics, Medical education

INTRODUCTION

There are many different reasons why students choose medicine. These include those who choose medicine by their own choice, as well as those who do so on the recommendation of their family, and those who are influenced by social media. Of the hundreds of medical students who come together with different motivations, very few have any idea how to adapt to their new role as a medical student. This is why dissection rooms in anatomy departments serve as the first bridge between the public and the medical world for beginner medical students [1].

The science of anatomy, which examines the morphological characteristics of the body and organs, structural and functional relationships between organs, is known as the cornerstone of preclinical medical education [2,3]. Historically, cadaver dissection has been an important experience as a basic teaching tool in gross anatomy education for centuries and has formed a vital part of medical education [4-7]. The cadaver in anatomy education is the "first patient" and "first teacher" of a medical student. The "student-cadaver" interaction is very important as it is the first simulation of the "physician-patient" relationship [8-11].

There is a divergence of opinion between proponents of traditional anatomy and proponents of technology-assisted anatomy education. [12-14]. The worldwide trend in medical education is characterized by a shift towards student-centered, integrated, clinical practice models [9]. As a result, there has been a significant reduction in the amount of time devoted to cadaver dissection. This has significantly reduced the time allocated to traditional cadaver dissection [15,16]. However, cadaver dissection in the anatomy curriculum is important not only to learn anatomical structures in depth in three dimension but also to solve psychosocial problems that may be an obstacle to medical science [13,17].

Cadaver dissection is very important for medical students in terms of learning the three-dimensional relationships of anatomical structures comprehensively in understanding the human body [3,6,18,19]. In this context, studies have shown that cadaver dissection is a vital part of medical education to provide future physicians with anatomy knowledge that they can rely on throughout their careers [4,20,21].

Cadaver dissection is the basis for students to put theoretical knowledge into practice and understanding patients, establishing an emotional relationship with patients psychologically, balancing sensitivity and impartiality, and developing ethical values related to death and the human body [21-28]. Cadaver dissection is the basis for students to transfer theoretical knowledge to practice, to get used to working with a team, to learn to work in a disciplined manner, to develop manual skills, strategies to cope with stress and time management [20,29,30]. In short, the acquisition of the best professional principles, attitudes, expertise and behaviour starts from the first day of medical school and continues throughout the entire professional life. Cadaver dissection has a crucial role in attaining these acquisitions [25].

The study aimed to investigate the psychological effects of the cadaver dissection module on preclinical students in addition to anatomy education, to emphasise the importance of traditional cadaver dissection in medical faculties against developing technological materials, to raise awareness about body donation, to increase students'

motivation to be a medical student and physician during distance education applied in situations such as disasters and pandemics.

MATERIALS AND METHODS

The study included preclinical period students studying at Harran University Faculty of Medicine. A total of 131 (63.6%) 1st year students, 49 (23.8%) 2nd year students and 26 (12.6%) 3rd year students participated in the study. 90 (43.7%) male and 116 (56.3%) female students participated in the study. The approval decision numbered HRU/22.08.11 was obtained from the Harran University Clinical Research Ethics Committee for the study. In the online surveys, voluntary consent was first obtained. After they accepted the study by pressing the voluntary consent button, they could see the questions.

Design of the Practical Dissection Module

We divided the preclinical students into groups of ten and included them in the study. After determining the groups, we created a calendar for the application and announced it to the students. We determined the dissection time for each group as 2 hours. Before taking the students who would participate in the dissection into the hall, we asked whether they were hungry, and whether they had complaints such as dizziness or nausea. We made explanations about what a cadaver is and how it can be obtained. We answered the questions they were curious about. We made explanations about the cadaver dissection hall, explained the rules to be followed. We made them sign the document that they accepted the rules to be followed in the cadaver dissection hall. After entering the dissection hall, we opened the cadaver and introduced them to the cadaver. After waiting for them to get used to it for a while, we described the materials to be used in dissection and how to use them. After making explanations about the materials, we divided the students into groups of two. We distributed the student groups to 5 regions of the cadaver: head-neck, upper extremity, lower extremity, abdomen and thorax. We explained which anatomical structure (skin, fascia, subcutaneous adipose tissue, muscle, vessel, nerve, organ, etc.) should be dissected by showing how to dissect. The students started dissection after receiving the dissection materials and the instructors helped them throughout the process. After the dissection period was over, we gave suturing training.

Administering the Questionnaire

After the cadaver dissection, we shared the link to the online questionnaire with the participants. We asked them to answer the questions without changing their psychological state after dissection. Sociodemographic questions were the first in the survey questions. Then there were 24 questions in the form of a 5-point Likert scale by the researchers. We determined the scoring of the answers to the questions as strongly disagree (1); disagree (2), undecided (3); agree (4); strongly agree (5).

Statistical Analysis

We performed statistical analyzes using IBM SPSS version 20.0 (IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp.). We performed frequency analysis for categorical variables. For the descriptive statistics of the variables, we analyzed the mean ± standard deviation values. For the normality test of the distribution of the variables, we applied the Shapiro Wilk test. For the comparison of paired groups, we

used the independent sample t-test (Student's T test) for normally distributed variables and the Mann Whitney-u test for variables not normally distributed. We considered the statistical significance level as $p<0.005$.

RESULTS

The mean ages of 90 (43.7%) male and 116 (56.3%) female students were 20.33 ± 1.98 and 19.94 ± 1.17 years, respectively. 89.9% (n=185) of the participants stated that it was their choice to study medicine, while 10.2% (n=21) stated that it was not their choice to study medicine. 88.8% (n=183) of the volunteers stated that they were interested in medical education, while 11.2% (n=23) stated that they were not interested in medical education.

The frequency distributions of the answers given by the participants to the survey questions and the mean ± standard deviation values of the scores resulting from the scoring of the answers given are shown in Table 1.

In the normality test, we found that none of the variables were normally distributed. As a result of the comparative statistics (Mann Whitney-U test) between those who had seen cadavers before and those who had not seen cadavers before, we did not find a statistically significant difference between the groups in any question. Similarly, as a result of the comparative statistics (Kruskal-Wallis test) between the period 1, period 2 and period 3 groups, we did not find a statistically significant difference between the groups (Table 2).

DISCUSSION

The importance of cadaveric anatomy education in the medical curriculum is undeniable. For centuries, cadaveric training has been recommended as the cornerstone of anatomy education. This study demonstrated that cadaveric anatomy training has advantages over other methods and that learning anatomy by dissecting the cadaver with a hands-on method is superior to learning anatomy on a previously dissected cadaver. He also expressed the opinion that cadaver dissection is very important not only for anatomy education but also for increasing the motivation of physician candidates who have just started medical education and for the beginning of medical ethics gains.

Cadaver dissection provides in-depth learning of the three-dimensional structure of the human body, realization of variations, adoption of task management and teamwork, experience of how best to hold the scalpel. [31-34]. The widespread use of computers has led technological applications to develop the idea that dissection rooms and cadavers are not necessary and useful today, but can be replaced by a well-equipped computer room. However, this developing trend can reach dangerous proportions when the idea of using technology oversteps the boundaries and claims to replace other practice-based procedures or elements [35]. The lack of adequate infrastructure and equipment for dissection rooms creates problems for educators and students. The time and cost constraints of cadaver dissection, the need for highly qualified teachers, the emotionally demanding nature of dissection, and the psychological distress it causes among students are seen as disadvantages. Therefore, reducing the use of cadaver dissection as an educational tool has a negative impact on anatomy knowledge. Conflicts of opinion between proponents of traditional anatomy education based on cadaver dissection and proponents of anatomy education based on technological applications can lead to disagreements [32,36]. Virtual simulation, which is a product of technology, reduces the dependence of education on cadavers as it provides an educational, efficient and effective training program [37]. However, cadaver dissection should not only be considered as a part of anatomy education

but also in terms of socialization, acquisition of norms, values and ideologies of the profession, moral and ethical culture and emotional demands in the hidden curriculum of medical education [38].

As a result of the study conducted by Biswas and Bandyopadhyay in West Bengal, India in 2019, 82.2% of the participants agreed that it is important to include cadaver dissection in the curriculum, 85. 4% agreed that there should be a sense of respect for the dead body during cadaver dissection, 88.3% agreed that students should actively participate in cadaver dissections, but 79.6% of the participants did not agree with the idea that model and computer-aided education would replace cadaver dissection. In the form of agree or strongly agree, 96.6% of the volunteers who participated in our study stated that it is important to include cadaver dissection in the curriculum, 96.6% stated that the practical dissection module contributes to ethical values, 96.1% stated that they think that students should actively participate in cadaver dissection training, 71.8% stated that they think that models or computer-aided technological products cannot replace cadavers [39].

Darras et al. [40] evaluated the answers given by the participants with a 5-point scale in their study on virtual and cadaveric dissection laboratories enhanced in 2019. As a result of the study, they reported that the score of the response to the opinion that seeing radiographic anatomy on the virtual dissection table improves understanding was 4.08, and the score of the response to the opinion that the content seen on the virtual dissection table provides a better understanding of clinical cases as 4.09.

Souza et al. [41] conducted a study in a module on the values and ethical teaching of cadaver dissection in 2020. As a result of the study, the average of the answers to the survey questions on a 5-point scale was as follows: 3.75 for the opinion that the module develops empathy and emotions, 3.79 for the opinion that the dissection activity allows sharing ideas with others, 3.73 for the opinion that the module sensitizes students to their future professional life, and 3.97 for the opinion that the module develops respect for the cadaver. The mean and standard deviation values of the volunteers' answers to the question "Practical dissection module informed me about the ethical values to be followed in dissection" were 4.60 ± 0.57.

Izunya et al. [42] in 2010, 84% of the participants stated that cadaver dissection is the best method of learning anatomy, 39% stated that plastic models and computer-aided applications will not replace cadaver dissection in the future, 71% stated that cadaver dissection gives better results than prosected specimens and 90% stated that cadaver dissection is still very important and indispensable.

In a survey study conducted by Lalit et al. [43] in 2018 with ten newly admitted 150 first-year medical students, 90.57% of the participants stated that they thought that real hands-on training on cadaver dissection gave better results than showing cut specimens. 79.71% of the participants stated that they did not think that cadaver dissection technique would be replaced by plastic models etc. in the near future. 89.85% of the learners thought that cadaver dissection was indispensable in anatomy learning, 96.37% thought that cadaver dissection was the best method for learning anatomy, 95.65% thought that dissection was an important part of the medical curriculum in anatomy education.

As a result of our study, 91.8% of the participants agreed or strongly agreed with the question "My participation in cadaver dissection provided me with more opportunities to develop professional skills than the demonstration of a prosectioned (previously dissected) cadaver".

As a result of the cadaver dissection study conducted by Nikhil et al. [19] in 2020, 90.6% of the participants reported that the training they received helped them to have a good coping mechanism to overcome their ethical concerns. Regarding the educational value of cadavers in anatomy teaching, 71.9% of the learners participating in the same study rejected that other teaching materials such as videos and models can explain human anatomy better than cadavers.

As a result of the study conducted by Kolla et al. [44] in 2020, on the Perception of Virtual Reality Training Module for Anatomy Education by Medical Students, participants reported that virtual reality was a useful tool for learning the placement of anatomical structures and anatomical relationships in three dimensions. In fact, most of the participants stated that they would prefer anal reality to lectures and cadavers in learning anatomy. However, the authors expressed the opinion that even if virtual reality has benefits over lecture and cadaver, it will eliminate many important skills to be acquired through cadaver dissection and the psychosocial aspect of the cadaver.

As a result of the study conducted by Erer Kafa et al. [45] in 2021, 90.2% of the participants stated that sharing cadaveric images on social media is unethical, and 93.7% stated that gaining a sense of ethics and privacy about the cadaver is important in terms of medical ethics and patient privacy. It was determined that 81.1% of the students who participated in this study expressed a negative opinion by disagreeing or strongly disagreeing with the question "Photos/videos can be taken with the cadaver and the photos/videos can be shared on social media (facebook, instagram, twitter, snapchat etc.)."

As a result of the 5-point Likert (scaled 0-4) study conducted by Bahşi et al. [2] in 2021 investigating the emotional effects of cadaver on medical students before the student's first encounter with the cadaver, the mean answers of the participants to the questions "I am excited to encounter the cadaver" and "The idea of having an encounter with a cadaver is intriguing to me" were 2.36 ± 1.16 and 2.75 ± 1.01, respectively. In our study, the mean answers of the participants to the questions about their feelings before the first encounter with the cadaver were "I was curious about cadavers before I met cadaver, 4.61 ± 0.57; I was interested in cadavers before I meet cadaver, 4.39 ± 0.79; I was excited about cadavers before I meet cadaver, 4.47 ± 0.78; I was anxious/fearful about cadavers before I meet cadaver, 2.47 ± 1.13.

CONCLUSION

The importance of anatomy education in the medical curriculum and the importance of the cadaver in anatomy education has been emphasized for centuries. Although the applications related to learning the three-dimensional structure of anatomical structures offered to us by the developing technology contribute to learning anatomy, they cannot replace traditional cadaver dissection. Because cadaver dissection contributes not only to the acquisition of anatomy knowledge, but also to the preparation of future doctors for professional professional life with psychomotor, psychosocial and motivational aspects of being a physician. As a result of this study, the mean of

the participant's answer to the question "Approaching the cadaver is as sensitive and important as approaching the patient" was 4.60 ± 0.62, the mean of their answer to the question "Gaining a sense of ethics and privacy regarding cadavers is important in terms of medical ethics and patient privacy" was 4.70 ± 0.55, the mean of their answer to the question "Models or computer-assisted education can replace cadaver dissection" was 2.17 ± 1.30, "Practical dissection module sensitized me to my future professional life" was 4.57 ± 0.58, "Practical dissection module supported the development of my psychomotor skills in preparation for clinical training" was 4.48 ± 0.68, "As a result of the practical dissection module, my interest and motivation towards a medical education and the profession of medicine increased" was 4.58 ± 0.69 supports our hypothesis.

Although technology and artificial intelligence facilitate learning, the multifaceted benefits of the cadaver cannot be denied and the cadaver cannot be excluded from anatomy education. In fact, the role of the cadaver in medical education will be further strengthened by having the student personally dissect the cadaver rather than using previously dissected cadavers. In today's conditions, the importance of cadavers should be emphasized with similar studies against the increasingly difficult cadaver procurement due to the scarcity of cadaver donations and high costs, and cadaver procurement should be encouraged.

Advantages of the study

* It has increased the sense of curiosity of students who are new to medical education to do cadaver dissection.

*It has increased the performance of the students after the distance education applied during Covid 19 and after the earthquake.

* It has increased students' interest in anatomy education.

* It has contributed to the gains of students about medical ethics.

* It has increased the students' motivation to become a physician.

Disadvantages of the study

* Insufficient number of cadavers.

* The module can be applied to a limited number of students.

* The application of the module in a limited time.

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Table 1. Frequency distribution and descriptive statistics values of the answers given to the survey questions.

	Questions	1(%)	2(%)	3(%)	4(%)	5(%)	M ± SD
1.	I was curious about cadavers before I meet cadaver.	0.0	0.5	2.9	31.1	65.5	4.61 ± 0.57
2.	I was interested in cadavers before I meet cadaver.	0.5	1.9	10.7	31.6	55.3	4.39 ± 0.79
3.	I was excited about cadavers before I meet cadaver.	0.0	3.4	7.3	28.2	61.2	4.47 ± 0.78
4.	I was anxious/fearful about cadavers before I meet cadaver.	18.9	42.2	17.0	16.5	5.3	2.47 ± 1.13
5.	Before meeting a cadaver, there was a feeling of disgust towards cadavers.	32.5	44.7	14.1	7.3	1.5	2.05 ± 0.94
6.	I was curious about the cadaver when I first meet cadaver.	0.5	3.4	7.8	38.3	50.0	4.34 ± 0.80
7.	I was excited when I meet the cadaver for the first time.	0.0	8.3	9.2	40.8	41.7	4.16 ± 0.90
8.	I felt fear/anxiety when I first meet a cadaver.	34.5	37.4	13.6	13.6	1.0	2.09 ± 1.05
9.	The first time I meet a cadaver, I was disgusted.	40.3	36.9	12.1	10.2	0.5	1.94 ± 0.99
10.	The cadaver should be more respected as it contributes to medical education.	1.5	1.0	5.8	26.7	65.0	4.53 ± 0.78
11.	Photos/videos can be taken with the cadaver and the photos/videos can be shared on social media (facebook, instagram, twitter, snapchat etc.).	66.5	14.6	10.7	6.8	1.5	1.62 ± 1.01
12.	Approaching the cadaver is as sensitive and important as approaching the patient.	0.0	1.5	2.9	29.6	66.0	4.60 ± 0.62
13.	Gaining a sense of ethics and privacy regarding cadavers is important in terms of medical ethics and patient privacy.	0.0	1.0	1.9	22.8	74.3	4.70 ± 0.55
14.	It is important to include cadaver dissection in the curriculum.	0.0	0.0	3.4	21.8	74.8	4.71 ± 0.52
15.	Models or computer-assisted education can replace cadaver dissection.	38.8	33.0	11.7	5.8	10.7	2.17 ± 1.30
16.	Active participation of students in cadaver dissection should be ensured.	0.5	0.5	2.9	29.1	67.0	4.62 ± 0.62
17.	Hands-on dissection module sensitized me to my future professional life.	0.0	0.5	2.9	35.4	61.2	4.57 ± 0.58
18.	Hands-on dissection module had the potential to broaden the range of learning outcomes required for future doctors.	0.0	0.0	3.9	37.4	58.7	4.55 ± 0.57

19.	Hands-on dissection module supported the development of my psychomotor skills in preparation for clinical training.	0.0	1.0	7.8	33.5	57.8	4.48 ± 0.68
20.	My participation in cadaver dissection provided me with more opportunities to develop professional skills than the demonstration of a prosectioned (previously dissected) cadaver.	0.0	1.0	7.3	36.9	54.9	4.46 ± 0.67
21.	Hands-on dissection module informed me about the ethical values to be followed in dissection.	0.0	0.5	2.9	32.5	64.1	4.60 ± 0.57
22.	From now on I will feel more responsible for using the tools and equipment of the dissection room and the school for effective learning.	0.0	0.0	1.5	35.4	63.1	4.62 ± 0.52
23.	Hands-on dissection module increased my sense of gratitude towards people who donated their bodies to medical education.	0.0	0.5	1.5	26.7	71.4	4.69 ± 0.52
24.	As a result of the hands-on dissection module, my interest and motivation towards medical education and the profession of medicine increased.	1.0	0.5	4.4	27.7	66.5	4.58 ± 0.69

Table 2. Comparative statistics between Group I and Group II

Questions	Group I (n=183) Mean ± SD	Group II (n=23) Mean ± SD	p
I was curious about cadavers before I meet cadaver.	4.65 ± 0.56	4.30 ± 0.55	0.001
I was interested in cadavers before I meet cadaver.	4.44 ± 0.77	3.95 ± 0.82	0.002
I was excited about cadavers before I meet cadaver.	4.52 ± 0.75	4.09 ± 0.90	0.007
The first time I meet a cadaver, I was disgusted.	1.87 ± 0.95	2.39 ± 1.15	0.032
Approaching the cadaver is as sensitive and important as approaching the patient.	4.63 ± 0.59	4.34 ± 0.77	0.045
Gaining a sense of ethics and privacy regarding cadavers is important in terms of medical ethics and patient privacy.	4.72 ± 0.55	4.52 ± 0.59	0.042
Hands-on dissection module sensitized me to my future professional life.	4.61 ± 0.57	4.26 ± 0.54	0.002
Hands-on dissection module had the potential to broaden the range of learning outcomes required for future doctors.	4.58 ± 0.55	4.26± 0.61	0.011
Hands-on dissection module supported the development of my psychomotor skills in preparation for clinical training.	4.54 ± 0.63	4.01 ± 0.85	0.001
From now on I will feel more responsible for using the tools and equipment of the dissection room and the school for effective learning.	4.64 ± 0.51	4.39 ± 0.58	0.032
As a result of the Hands-on dissection module, my interest and motivation towards medical education and the profession of medicine increased.	4.68 ± 0.53	3.78 ± 1.16	0.001

Gruop I- Those who study medicine with interest, Group II- those who study medicine with no interest