Preferred Modalities for learning Anatomy: Medical students' opinion

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ABSTRACT

Learning anatomy is the basic and essential component of medical study when students start to learn in medical career. Since five hundred years ago, the human cadaver has been used as the silent mentor for students in learning anatomy. Later, pre-dissected specimens were used in addition to hands-on dissection of human cadaver. Current advances promote the use of anatomical models as well as plastinated specimens. This study focused on analyzing the preference of students towards different learning modalities available for anatomy teaching. It was conducted on first year medical students at the Faculty of Medicine and Health Sciences, University Malaysia Sabah (FPSK, UMS). A total of 76 students (27 males and 49 females) participated in this study. Out of 76 students, 57 (75%) students preferred using human cadaver for anatomy learning. Four students (5.3%) opted for plastinated specimen while 15 students (19.7%) chose the plastic model. Knowledge gained in learning Anatomy was said to be easier from cadaver (67.1%), followed by plastinated specimen (35.5%) and plastic models (52.6%). In the present study, 97.4% responded that plastic model was easier to apply their knowledge in objective structured practical examinations. The present study found that using cadaver was still favoured by medical students. Further studies are required to determine the preference between hands-on cadaveric dissections versus pre-dissected specimens.

Keywords: anatomy, plastic model, plastinated specimen, cadaver

INTRODUCTION

The study of structure of human body, gross anatomy, is the basic and important part when medical students start to learn in medical career[1-2]. In medical practice, patients present with a problem in relation to a body part or an Anatomical site on the body. Identifying the anatomical site of lesion is the key to effective problem solving in medical practice. The required Anatomical knowledge can be achieved by exposing and examining of the structures inside the body through systematic dissection of human cadaver. Thus, thorough knowledge of anatomy is essential from the very beginning of medical year[3]. As such, the human cadaver has been used as a major learning tool in anatomy teaching for more than five hundred years[4].

Cadaver dissection has been a regular feature since the Renaissance[2]. Before entering the dissection rooms, students may experience considerable stress and anxiety because the first patient that he/she will face is a dead one [5]. Hands-on dissection of cadaver can provide experience on the structure of the body, especially three-dimensional aspect of human anatomy and anatomical variations as there are no individuals who are identical anatomically[3, 6].

In dissection room, small group teaching around cadaver can create an atmosphere forself-directed learning, integration of knowledge from text books and lectures with practice, respect for human body and develop team working spirit. It can also initiate bonding with colleagues while experiencing the tactile appreciation for fabric of human body which cannot be achieved by computerized learning aids and prosected specimens[7-10].

Prakash et al (2007)[10] stated that cadavers are teachers in medical education and mention dissection as a precious experience that should not be missed. So cadavers are labelled as silent mentors and cadaver dissection puts the undergraduate students at the "sharp end of medical education"[11-12]. More than 75% of pre-clinical students in Nigeria still agreed that cadaver dissection enhanced their thinking ability. It is the best method and essential for learning anatomy[13-15].

Over the past decade, there are many changes in undergraduate anatomy teaching as a result of advances in science and technology. The traditional anatomy education was based on topographical structural anatomy taught by didactic lectures and complete dissection of the body. Reduction in cadaveric donation and reduce availability of resources have forced the medical educators to adopt

newer and more advanced methods of teaching. For example, use of new preservative technique such as plastination[16-17], use of plastic models, prosection-based methods and multimedia–based learning packages[2,4,18].

The reasons behind these changes include extremely expensive dissection room, difficulties in obtaining enough cadavers for teaching, time consuming, potentially hazardous and shortage of qualified anatomists[2]. However Pawlina pointed that students who viewed only plastic models were likely to get superficial orientation towards human body, misinformation and less appreciation to anatomical variations[19].

Computer assisted learning are useful tools in enhancing learning Anatomy but it cannot totally replace the emotional and educational experience gained from cadaver dissection[20]. Stephen et al (2013)[21] concluded that traditional method of anatomy teaching as cadaveric dissectionis still perceived to be highly suitable for achieving learning objectives in undergraduate anatomy course.

Azu et al (2012)[22] stated that plastinated prosected parts should be used in early stages of undergraduate training but opportunities for learning with wet cadaver specimens may further enhance the achievement of learning outcomes. In Singapore, 76.7% of medical students (from all five years of medical course) felt that gross anatomy is clinically important and 88.7% agreed that the cadaveric dissection deepened their understanding of gross anatomy[23]. Researchers have stated that students from the University of Melbourne favoured dissection method in learning gross anatomy and it would not be replaced by other teaching methods such as computer assisted learning[24-26].

MATERIALS AND METHODS

A crosssectional study involving the first year medical students during 2013-2014 academic year was conducted during Anatomy session at the University Malaysia Sabah, Malaysia. Out of 90 students, 76 students (27 males and 49 females) participated in this study. The self-administered questionnaires were used to determine the preference of year 1 medical students in learning of Anatomy; cadaver or

 plastinated specimen or plastic model. The objective of the study was clearly explained to each student and questionnaires were distributed after obtaining their consent. As the medium of instruction in the medical school is English, all the questionnaires were developed in simple English.

The questionnaires focused on the following aspects.

- **Demographic details** of the students including age and gender

- **User Friendliness**: Students are required to rate whether the specimen in question is easy to handle and easy to explore. The rating scale ranged from poor, average to good.

- **Ability to facilitate understanding through observation**: Students need to choose poor, average or good for each type of specimen.

- **Ability to facilitate knowledge gain:** Students are to respond whether they gain new knowledge by examining each type of specimen.

- **Applicability in practical examination (OSPE):** Students have to answer whether the specific type of Anatomy specimen is applicable in their OSPE (Objective Structured Practical Examination) examinations.

- **General Preference:** Students are to choose one most favoured Anatomy specimen out of three types and state the reasons why they favoured the specific type.

- **Opinion Rating :** Students are asked to give their opinion on a Likert scale of 1 (lowest rank) to 5 (highest rank) regarding the following aspects :-

  - ❖ easy to handle

  - ❖ easy to observe

  - ❖ easy for knowledge acquisition

  - ❖ easy to recognize and

  - ❖ easy to understand the important anatomical relations

Data analysis: The results were reviewed by the authors and the students' responses were verified whenever required. The analysis was done by the use of Statistical Package for Social Sciences (SPSS version 16) and Microsoft Excel software.

RESULTS

A total of 76 medical students (27 male and 49 female) who had undergone Anatomy teaching within the past one month were included in the study. The students were between 19 to 21 years of age with the mean age of 20 years. Although all students under study were of Malaysian nationality, they represented diverse ethnicity like Malays, Chinese, Indian, Bajau, and Sabah ethnic groups like Kadazan, Dusun and Rungus.

1. User Friendliness

The following table depicts the students' response on user friendliness of three different types of Anatomy specimens and the majority of them (about 80%) gave high scores to all three types. Poor score was given by only one student to cadaver and three students to plastinated specimen (Table 1).

Table 1: User Friendliness of Different types of Anatomy Specimens

Type of specimen	Poor	Average	Good	Total
Cadaver	1	12	63 (82.9%)	76
Plastinated Specimen	3	13	60 (78.9%)	76
Model	0	12	64 (84.2%)	76

2. Ability to facilitate understanding through observation

Two students provided poor rating to the anatomical models and four students rated the plastinated specimen as a very poor aid in assisting understanding of the subject as those specimens lacked clarity of details. None of the students regarded the cadaver as a poor specimen in facilitating their understanding of Anatomy (Table 2).

Table 2: Facilitate understanding of Anatomy using different types of specimens

Type of specimen	Poor	Average	Good	Total
Cadaver	0	13	63 (82.9%)	76
Plastinated Specimen	4	18	54 (71.1%)	76
Model	2	11	63 (82.9%)	76

3. Ability to facilitate knowledge gain

Over 75% of students agreed that all three types of specimens aided in effective knowledge gain. However, three students rated poor for recognition of the Anatomy parts through model. Plastinated specimens also got three poor ratings. Regarding the understanding of the importance of Anatomical relations and its variations, cadavers and models got three poor ratings and plastinated specimens got four poor ratings (Table 3).

Table 3: Facilitate Knowledge gain of Anatomy using different types of specimens

Type of specimen	Good gain in Knowledge	Good for recognition	Good for understanding	Total
Cadaver	68 (89.5%)	69 (90.8%)	69 (90.8%)	76
Plastinated Specimen	60 (78.9%)	61 (80.3%)	62 (81.6%)	76
Model	62 (81.6%)	65 (85.5%)	63 (82.9%)	76

4. Applicability in Practical Examinations

In relation to the specimens' applicability in the practical examinations like OSPE (Objective Structured Practical Examination), more than 90% pointed out that the models are most suitable. Cadaver and plastinated specimens were preferred by less than 70% of students (Figure 1).
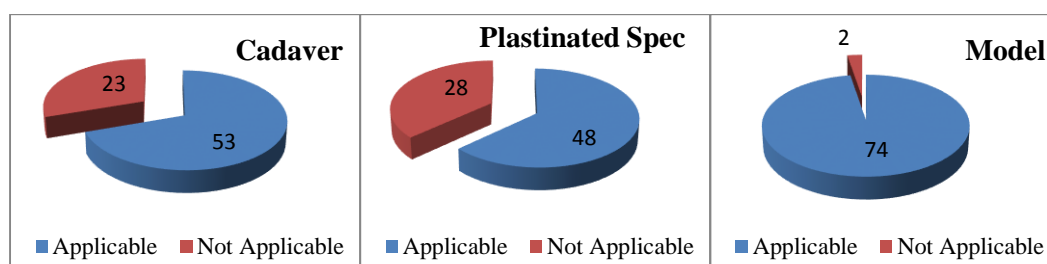

Figure 1: Applicability of different specimens in Practical Examinations

5. Students' preference and Reasons for their preference

When students' preference of the specimens in general was asked, the preference was in the order of cadaver (75%), Model (19.7%) and Plastinated Specimen (5.3%). Reasons for their preference to cadaver includes – closer to reality, clearly seen during practical sessions, closer to seeing real human beings, touch and feel like real human, easy to explore, aids in understanding real human body, enhance interest in the subject and initiation of some responsibility to study medicine so as to save life of human beings (Figure 2).
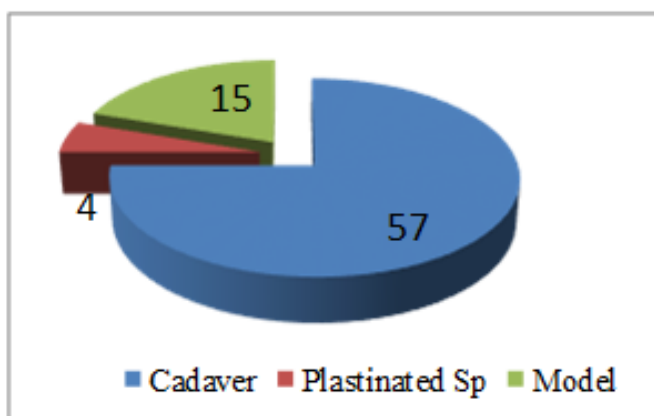
Figure 2: Students' Preference of Anatomical specimens

Those students who prefer the model explained that the models are colourful and attractive and easy to handle without using gloves. They also claimed that models aided in recognition of differences as the differentiation is clearly presented in different colours.

6. Composite Scores of students' preference

Students were asked to give opinion of the three different specimens on a Likert scale ranging from 1 (least preference) to 5 (highest preference). The opinion was asked on five characteristics including: (1) easy to handle (2) easy to observe (3) easy for knowledge acquisition (4) easy to recognize and (5) easy to understand the important anatomical relations. The results were compiled into a composite score and analyzed. Mean composite score of preference was highest for cadaver followed by model and the

plastinated specimen obtained the least score. One way ANOVA results showed that the three groups differed significantly (p< 0.008). Stratified analysis on gender also showed similar results (Table 4).

Table 4: Mean Composite Scores for Different types of Anatomy Specimen

Type of Specimen	Range	Mean	SE mean
Cadaver	12-25	22.04	0.34
Plastinated Specimen	10-25	20.35	0.41
Model	8-25	21.59	0.43
One way ANOVA	*F=4.877 at 2 df p< 0.008*		

DISCUSSION

Anatomy education is an essential and integral part of the medical curriculum and helps to further the development of medical professionalism. Gross human anatomy is one of the branches of anatomy which has allowed medical knowledge to develop. Therefore, from a historical point of view, human anatomy can be considered one of the basic pillars of medical training[2]. The study of structure of the human body is difficult to memorize and retrieve without using teaching and learning aids. Cadaveric dissection has persisted as a primary teaching/learning tool in anatomy for a long time. The benefits include the gaining of practical skills such as appreciation of the human body, first-hand understanding of anatomical variability, learning teamwork and peer interaction, as well as ultimately gaining a first-hand appreciation of human life through a first-hand understanding of death and dying[27].

But cadaveric dissection is no more important in medical training due to several problems such as time consuming, difficulties in acquisition of cadavers and shortage of qualified anatomists. Even within the anatomist community, there are differing viewpoints as to whether the new methods of teaching anatomy are better than the traditional use of cadaveric dissection. In a survey of 112 professional anatomists, Patel and Moxham found that the order of preference for teaching methods (in

descending order) was cadaveric dissection by students, prosection, living and radiological anatomy, computer-aided learning (CAL), didactic lectures alone, and the use of models. In most of the anatomy department in medical universities the role of cadaveric dissection as the primary mode of anatomy teaching has been reduced or replaced by more innovative approaches such as prosection, plastinated specimens, plastic models and mutimedia - based learning packages[28].

Many studies reported the effectiveness of cadaveric dissection in anatomy teaching and learning. Leong reported that 60.7% of the students of National University of Singapore found dissection helpful and 28% of them found very helpful in their understanding of gross anatomy. When asked whether dissection should be replaced completely by demonstrations on prosected specimens, 86.7% gave a resounding no[23]. In our present study no cardaveric dissection by students was done and the cadaver, plastinated specimen and plastic models are demonstrated by clinical anatomists in practical session.

Plastination is a relatively new advancement in cadaveric science; an effective technique of tissue preservation of entireorgans or cross-sectional body slices. Using polymers such as resin, silicone, and polyester give differing mechanical properties that ultimately result in robust, dry, odourless, and life-like specimens, which can be used well in an educational capacity in gross anatomy. Student satisfaction and acceptance has also been recorded using plastinated models as well as a significant difference between control and experimental groups observed in assessment scores[29].

Many institutions have overcome problems surrounding dissection with plastic models. Plastic specimens are modelled to perfectionand possess a longer shelf-life than cadavers but they will eventually pose problems. No human body is ever modelled to perfection where all organs are colour coordinated and impeccably shaped[30].

There are no studies on comparison on effectiveness of plastination and plastic models using as anatomy teaching tools. However the present study was conducted to determine the preference of Anatomy specimen (cadaver or plastinated specimen or plastic model) among the first year medical students for their effective learning of Anatomy.

According to the results, in the students' response on user friendliness of three different Anatomy specimens the majority of them (about 80%) gave high scores to all three types. Poor score was given by only one student to cadaver and three students to plastinated specimen. Most of first year medical students are affability to three different types of materials in anatomy learning.

In facilitating the student' understanding of anatomy cadaver specimen and models recorded more than 80%. Over 75% of students agreed that all three types of materials aided in effective knowledge gain. Cadaver specimen gave better for recognition and understanding than other two.

In the present study 75% of students agreed that cadaveric specimen was the most preference in learning anatomy. Reasons for their preference to cadaver includes – closer to reality, clearly seen during practical session, closer to seeing real human beings, touch and feel like real human, easy to explore, aids in understanding real human body. This finding is in line with the study of Izunya et al (2010) and Oyeyipo (2012), that majority of the students (90%) considered cadaver dissection as important and indispensable in the study of human anatomy and still remain best method for learning anatomy[13, 14]. Similar findings were reported elsewhere by Rajkumari et al (2008), Abay et al (2012), Weerasuriya (2014)[7, 15, 31]. This is contrary to the report by Rehman, et al (2012)[32].

The different colour presentation of the model can be made easier identification and differentiation in practical examination. We observed that, in relation to the specimens' applicability in the practical examinations like OSPE (Objective Structured Practical Examination), more than 90% pointed out that the models are most applicable. This is contrary with the results by Godson (2010)[33].

CONCLUSION

The study strongly indicated the medical students' preference to cadaver during their Anatomy learning sessions. The students rated cadaver as the most preferred specimen for better acquisition of knowledge, easy recognition and deeper understanding of the subject. In addition, they preferred cadaver as it is closer to reality and more relevant to the human being. It is recommended that these findings should be taken into consideration in future curriculum development of medical schools.

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