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Perceptions of students about the use of plastination in anatomy lessons

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ABSTRACT

Objective: This study was to examine the opinions of first-year veterinary faculty students about the use of plastinated anatomic prosections in addition to wet cadavers in anatomy practical lessons.

Materials and Methods: The students were shown plastinated organs and organs fixed in formaldehyde. Then a questionnaire comprising 7 questions was administered to the 100 student participants. The questionnaire responses were analyzed statistically using SPSS vn. 22.0 Frequencies software.

Results: In response to question 1, 58.4% of the students thought that there was no anatomic difference between the plastinated organs and the organs fixed in formaldehyde. In contrast to the strong smell of formaldehyde, 88% of the students stated that the plastinates were odourless. The use of plastinated organs was thought to improve the quality of education by 89.1% of the students, compared to the negative aspects of formaldehyde. It was stated by 84.2% of the students that plastinated organs should be included in anatomy lessons due to the thoughts of the majority of the students that plastinated tissues could make a greater contribution to anatomy lessons. In response to the final question, 92.1% of the students stated that they felt no abhorrence of the plastinated organs.

Conclusion: Plastination may be especially useful for educational institutions without access, space, or the financial resources for dissection, and can emphasize unique or pathological samples. The results of this study demonstrated that plastinated samples were perceived as a useful addition to traditional resources in the teaching of anatomy.

Keywords: *Anatomy, Plastination, Questionnaire*

INTRODUCTION

The rapid tempo of technological and economic developments has brought about greater demands from education systems. The most important requirements for students are to focus on the importance of lifelong learning to be able to adapt to global changes, to continuously develop knowledge and skills, to think critically, and to inspire creativity and innovation (Integrated ICT into education, 2009).

In the education and training of medical, dental and veterinary practitioners, anatomy is one of the most important and clinically relevant syllabus requirements. In recent years there have been significant changes in the teaching of anatomy to meet the demands and developments of syllabus design (Drake, 1998; Drake et al., 2009; Pyle, 2012; Souza and Devi, 2014). Although many anatomists prefer the use of dissection rather than other teaching tools, the debate is still ongoing as to whether cadaver dissections are appropriate or not in anatomy education (Patel and Moxham, 2006; Korf et al., 2008; Drake et al., 2009; Pyle, 2012; Estai and Bunt, 2016).

Formaldehyde (FA), which is said to be a carcinogenic agent is widely used in anatomy laboratories as a solution of formaldehyde and water. At room temperature, formaldehyde is a colourless gas, and can be determined by the smell in concentrations of 0.5-1.0 parts formaldehyde in a million parts of air (parts per million–ppm) (Costa and Amdur, 1996). Formaldehyde constitutes an occupational risk in both classroom and laboratory classes for anatomy instructors who are counseling students and conducting administrative activities and research. In addition, students who are working with tissues preserved in formaldehyde and instructors who are demonstrating or supervising students conducting certain dissection or prosection activities are at risk of exposure to formaldehyde during anatomy laboratory sessions (Mirabelli et al., 2011).

In laboratories where tissues are preserved in formaldehyde-based solutions, the routes to potential formaldehyde exposure are (a) absorption through the respiratory tract with inhalation through the nose or mouth, (b) absorption through the skin after dermal contact, (c) splashes into the mouth which is swallowed or from eating or smoking using the hands, (d) absorption into the digestive system through injection. As mummified tissues in particular are close to the respiratory regions of the students and instructors, the risk of inhalation exposure is high (Costa and Amdur, 1996). Acute formaldehyde exposure is associated with the destruction of the eyes, nose, throat, and respiratory pathways. Long-term exposure has been associated with mild neurological symptoms such as headache, dizziness, and genetic damage. The classification of the carcinogenity of formaldehyde is based to a large extent on carcinogenity in human nasal pathways and genotoxicity in human lungs and nasal epithelial cells, and in rodent lung epithelial cells (IARC, 2006; ATSDR, 2010).

Instructors and students want to be able to use a truly ideal educational material which is odorless, dry, robust and resistant, also protecting their health, without the need to use protective equipment such as gloves and masks (Bilge et al., 2014).

The desire to preserve human organic tissue is as old as humanity. In the past, different mummification methods have been developed but none have been defined as excellent. Plastination is one of the newest and most ideal preservation methods.

Plastination is an organic tissue preservation method which is widely used in anatomy to produce durable anatomic samples of the whole body or body parts. Plastination has been developed as much for research as for teaching purposes (Sora et al., 2019). It is an alternative tissue preservation technique that was developed by Dr von Hagens at the end of the 1970s (von Hagens, 1979).

It is defined by the International Plastination Association as a tissue preservation technique in which "the fluids and lipids in biological tissues are replaced with curable polymers resulting in hardened, dry, odorless, and durable samples" (International Society for Plastination, 2016). The general public has become familiar with plastination through exhibitions at the Body Worlds and Body Works museums (BODIES, 2016; Klaus et al., 2018).

The aim of this study was to examine the opinions of first-year veterinary faculty students about the use of plastinated anatomic prosections in addition to wet cadavers in anatomy practical lessons.

MATERIALS and METHODS

The study was conducted in the Anatomy Department of Firat University Veterinary Faculty. First, the students were shown plastinated organs and organs fixed in formaldehyde. Then a questionnaire comprising 7 questions was administered to the 100 student participants. The questionnaire responses were analyzed statistically using SPSS vn. 22.0 Frequencies software.

The questions on the questionnaire were:

Is there an anatomic structural difference between plastinated samples and samples fixed in formaldehyde?

Is there an odour to plastinated samples?

Can you touch plastinated samples without gloves?

Do you think that plastinated samples are healthier than samples fixed in formaldehyde?

Do you think that the use of plastinated samples improves the quality of your education?

Would you like to use plastinates in all anatomy lessons?

Do you feel any abhorrence when touching plastinated samples?

RESULTS

The questionnaire responses given by the students are shown in Figure 1.

In response to question 1, 58.4% of the students thought that there was no anatomic difference between the plastinated organs and the organs fixed in formaldehyde.

In contrast to the strong smell of formaldehyde, 88% of the students stated that the plastinates were odourless.

Although cadavers were touched using gloves in the majority of laboratory lessons, it was stated by 93.1% of the students that plastinated organs could be touched without gloves.

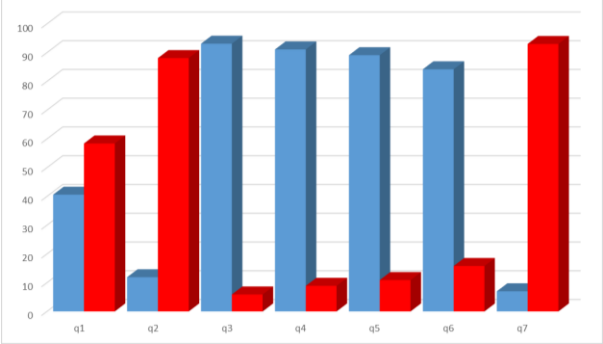

Figure 1. In the graphic columns of the answers received from the students, the blue "Yes" represents the red "No" answers.

It was reported by 91.1% of the students that plastinated tissues were healthier, whereas chemical remnants were present on organs fixed with formaldehyde.

The use of plastinated organs was thought to improve the quality of education by 89.1% of the students, compared to the negative aspects of formaldehyde. It was stated by 84.2% of the students that plastinated organs should be included in anatomy lessons due to the thoughts of the majority of the students that plastinated tissues could make a greater contribution to anatomy lessons.

In response to the final question, 92.1% of the students stated that they felt no abhorrence for the plastinated organs.

DISCUSSION

The role of dissection in the teaching of anatomy increased in the second half of the 20th century, resulting in new preservation techniques and anatomic models based on diagnostic observation (Elizondo-Oman˜a et al., 2005).

Plastination, as a biological tissue preservation method, was developed by Gunther von Hagens in the anatomy laboratory of Heidelberg University in 1978 and was used at that time for both teaching and research. The use of traditional cadaver dissection and more modern teaching resources allows different approaches in the teaching of anatomy, and is important in the development of practical and theoretical skills in both traditional and modern methods (Weiglein, 1997). However, there is an ongoing debate about which method or tools support the most productive learning experience (Patel and Moxham, 2008).

This study is the first to have reported the general knowledge, and perceptions of students about plastination and its use as an anatomy teaching resource in the Veterinary Faculty of Firat University. The results showed that the students considered plastination to be a valuable, new tool for learning anatomy.

Plastinates have become an ideal educational tool as they can be used outside the dissection room without the need for any special conditions. The students consider their use to be of benefit in the education system. It is generally accepted that plastinates are of great value as a learning and teaching resources (von Hagens et al., 1987; Fasel, 1988; Weiglein, 1997; Jones, 2002; Latorre et al., 2007; Frushstorfer et al., 2011), and therefore, many institutions now use plastinates to teach anatomy at degree level.

There are very few studies related to the opinions of veterinary faculty students about the use of plastinated samples. Latorre et al. (2007) investigated how the knowledge of veterinary and medical students developed using plastinated samples.

Fruhstorfer et al. (2011) investigated the opinions of first-year medical faculty students when wet cadaver samples were replaced with plastinated samples.

As stated in a previous study (Riederer, 2014), the use of plastinated samples is not limited to the dissection room, and it is an important factor that they can be used in practice for teaching purposes, can be exhibited in museums, and can be used at conferences for any educational purpose.

It is important to have high-quality resources during education on morphological subjects such as anatomy. The context in which anatomy is taught creates a difference in the learning perceptions of the students. Local curriculum

factors are important in creating an environment that facilitates learning (Smith et al., 2014).

The use of plastinates is helpful for students in identifying and understanding the necessary structures in anatomy. Several students have recommended that plastinated samples could be important in identifying structures and in understanding the 3-dimensional aspects of these structures. In a study by Reeves et al. (2004), it was reported that student dissection skills developed when additional computer learning support was used in gross anatomy.

For students to acquire anatomic knowledge and skills, it is necessary to use both traditional and modern techniques (Elizondo- Oman˜**a**, 2005). Fruhstorfer et al. (2011) expressed concerns that the majority of students who used only plastinates were completely removed from wet cadaver dissection.

During this study, the instructors reported that the use of plastinated samples facilitated teaching during the lessons and they wanted more samples. The same opinions were reflected in the student questionnaire.

CONCLUSION

The results of this study showed that the students felt that the use of plastinated samples both in the dissection room and in the anatomy museum was helpful for both learning and understanding anatomy. They recommended working with plastinated samples rather than touching wet cadavers. In practical anatomy applications, plastinates were greatly liked by the students as a teaching tool.

Plastination is accepted as a useful addition to cadaver dissection by most anatomy instructors and provides an important teaching resource in the curriculum of medical and veterinary faculties.

Plastination may be especially useful for educational institutions without access, space, or the financial resources for dissection, and can emphasize unique or pathological samples. The results of this study demonstrated that plastinated samples were perceived as a useful addition to traditional resources in the teaching of anatomy.

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