

Post-Covid-19 pandemic: How safe is cadaver dissection in medical schools?

Covid-19 pandemisi sonrası: Tıp fakültelerinde kadavra diseksiyonu ne kadar güvenli?

Oluwanisola Akanji Onigbinde^{1,*}, Abayomi Oyeyemi Ajagbe¹, Oluwatosin Imoleayo Oyeniran²,
Terkuma Chia¹

¹Department of Anatomy, Faculty of Basic Medical Sciences, College of Health Sciences, Nile University of Nigeria, Abuja, Nigeria

²Department of Physiology, Faculty of Basic Medical Sciences, College of Health Sciences, Nile University of Nigeria, Abuja, Nigeria

Corresponding author: Oluwanisola Akanji Onigbinde, MD., Department of Anatomy, Faculty of Basic Medical Sciences, College of Health Sciences, Nile University of Nigeria, Abuja, Nigeria

E-mail: onigbindesola@gmail.com





Received/Accepted: June 24, 2020 / September 25, 2021

Conflict of interest: There is not a conflict of interest.

SUMMARY

The practice of cadaver dissection is still largely used as a primary way of teaching and learning anatomy in several medical schools globally due to its enormous advantages. Despite the rise in the call for technology integration of virtual teaching into the modern medical education, especially virtual dissection in teaching anatomy, most medical schools prefer the conventional wet laboratory dissections over the new virtual dissections that are emerging. The surge in the creation of medical schools has led to a proportionate rise in demand for cadavers needed for dissection. Nevertheless, using human cadavers for teaching and training roles is embraced with certain ethical uncertainties. The recent emergence of COVID-19 has raised questions on the continuous use of traditional cadaveric dissections, as the cause of the death and safety of the bodies for dissection may not be ascertained before use. This paper recommends the guidelines and protocols to be followed before the use of bodies for dissection, and also proposes the possible integration and use of virtual dissection for anatomy teaching during and after the COVID-19 pandemic.

Keywords: Cadaver dissection, Covid-19, medical schools, pandemic, safety

 Oluwanisola Akanji Onigbinde
 Abayomi Oyeyemi Ajagbe
 Oluwatosin Imoleayo Oyeniran
 Terkuma Chia

ORCID IDs of the authors:

O.A.O. 0000-0001-5473-1034

A.O.A. 0000-0002-2110-2626

O.I.O. 0000-0001-6720-8453

T.C. 0000-0002-3257-459X

ÖZET

Kadavra diseksiyonu uygulaması, önemli üstünlüklerinden dolayı dünya çapında birçok tıp fakültesinde anatomiye öğretme ve öğrenmenin temel yolu olarak hala sıklıkla kullanılmaktadır. Anatomi eğitiminde sanal diseksiyon yöntemi başta olmak üzere sanal öğretim yöntemlerinin modern tıp eğitimine teknolojik olarak entegre edilmesi yönünde artan çağrılara rağmen çoğu tıp fakültesi geleneksel laboratuvar diseksiyonlarını geliştirmekte olan sanal diseksiyon yöntemlerine tercih etmektedir. Tıp fakültelerinin sayısındaki artış, diseksiyon için gereken kadavra talebinde de orantılı bir artışa yol açmıştır. Bununla birlikte, insan kadvralarının eğitim ve öğretim amaçları için kullanılması bazı etik belirsizliklerle karşılanmaktadır. Son dönemde ortaya çıkan COVID-19 salgını, ölüm nedeni ve bedenlerin diseksiyon için güvenliliği kullanımdan önce tespit edilemeyebileceğinden, geleneksel kadavra diseksiyonlarının süregelen kullanımı hakkında soruları yeniden gündeme getirmiştir. Bu makale, bedenler diseksiyon için kullanılmadan önce izlenecek ilkeleri ve protokolleri önermekte ve ayrıca COVID-19 pandemisi sırasında ve sonrasında anatomi öğretimi için sanal diseksiyonun olası entegrasyonu ve kullanımı konusunda yol göstermektedir.

Anahtar sözcükler: Kadavra diseksiyonu, Covid-19, tıp fakülteleri, pandemi, güvenlik

INTRODUCTION

The practice of cadaver dissection is still widely employed as a major means of teaching and learning anatomy in many medical schools globally^{1,2}. Cadaver dissection can be dated far back as 300 BC. It was regarded as a template for studying the structural details of the human body in the 15th century. The introductory cadaver dissection by the medical students was recorded in 16th century³. In the 18th-century cadaver dissection was established as an expedient area of medical education which was mainly performed at the beginning of medical training. Presently, it remained a cogent component of the curriculum for many medical undergraduate students³. Currently, there is an increase in the advocacy for technology integration of virtual teaching in modern medical education specifically virtual dissection in teaching anatomy⁴. However, the majority of the medical schools and colleges continue to choose the conventional wet laboratory dissections over the new virtual dissections that are evolving⁴. Although, the arguments for the continued use of cadaver are still ongoing globally, nonetheless, it seems there is no suitable replacement available, thereby resulting in its incessant usage by most medical schools either wholly or partially depending on the nature of their respective curricula⁵.

The advantages of cadaveric dissection have shown to outweigh its disadvantages as seen in several studies conducted on medical students in various climes^{4,6}. Cadaver dissection helps medical students to explore the human body realistically before performing any major and complex surgery on living patients. It also helps them in learning relations of human anatomic structures and the development of psychomotor skills during cadaveric dissection classes⁴. Anatomical variations seen in individual cadaver helps to widen their scope of medical knowledge in addition to textbooks and anatomical models⁴. The increase seen in the establishment of medical schools globally has also lead to a proportionate increase in demand for cadavers needed for dissection⁷. However, the use of human cadavers for teaching and training purposes is encompassed with some ethical uncertainties⁷.

One of the important issues regarding the use of cadavers for medical training is the sources of the cadavers. The International Federation of Associations of Anatomists (IFAA) recommended that only donated bodies be used for anatomy teaching and research⁸. This is not unexpected following the dark history that trails the acquisition

of bodies for anatomical dissection centuries ago^{5,9}. According to a two years survey conducted on sources of cadavers in 71 countries, 32% were donated while 57% were unclaimed bodies¹⁰. A sharp contrast has been noted in the sources of cadavers from different regions. Cadavers received from donations are approximately 80–100% of the total sources of cadavers in European and North American medical schools while about 90% of African medical schools still depend on unclaimed bodies¹¹. According to a similar three years survey conducted in Africa (Nigeria), results showed that approximately 100% of the cadavers fell under the category of unclaimed bodies with no record of voluntary donation¹². This simply means that most countries in Africa depend almost solely on unclaimed bodies or bodies of felons, while some in the Middle-East depend on importation of cadavers from other countries^{5,8-12}.

The advent of the novel coronavirus disease in December 2019 from Wuhan city in China has become a global burden as 9,062,837 confirmed cases and 470,716 deaths have been recorded globally as of June 23, 2020¹³. This emerging situation has introduced important dynamics for most human activities including anatomy education especially in countries that depend significantly on cadaver dissection. The most challenging issue is that some of these unclaimed bodies may not have medical records to ascertain the cause of death, which may pose a danger for dissection after the coronavirus pandemic subsides. Besides the nature of the death of these bodies, their safety for use by medical students for anatomical dissections is of great concern. Should the rise in COVID-19 mortalities result in increased availability and supply of cadavers for dissection, how safe would they be for students' dissection in various medical schools around the globe?

The main mode of transmission of COVID-19 virus between individuals according to the World Health Organisation (WHO) report, is through droplets, fomites, and close contact with infected persons and possibly spread through feces¹⁴. Although, as at the time of releasing this report in March 2020, there was no evidence of individuals getting infected from exposure to the bodies of people who died from COVID-19¹⁴. However, the suspected risk of COVID-19 infection from a dead body to health care professionals handling such bodies cannot be overlooked. Also, it is often claimed that fixatives are effective for the inactivation of infectious agents, nonetheless, even though cadavers are fixed, it may still be infectious

to those handling them¹⁵. Infectious diseases such as tuberculosis, gastro-intestinal pathogens, hepatitis B and C, HIV infection, Middle East Respiratory Syndrome (MERS), hemorrhagic fever viruses such as Ebola may be contracted via cadavers according to research findings^{16,17}. Some researchers opined that people who had passed away from the new coronavirus disease 2019 may still be contagious even after death but how long these bodies can be infectious remains unknown, while others stated that it can remain contagious for hours or days¹⁸.

The WHO confirmed that human severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) can remain infectious on surfaces as long as 9 days, as the SARS-CoV-2 virus has been detected after up to 72 hours in experimental conditions¹⁴. A similar research work revealed that the severe acute respiratory syndrome coronavirus (SARS-CoV) is very resistant to alkaline treatment and, even more surprisingly, the efficacy of formaldehyde fumigation is not seen on the dried virus (based on the conditions tested)¹⁹. Nevertheless, their findings suggested that only heat (autoclave) and hypochlorite chloride treatments are efficacious treatments for the decontamination of SARS-CoV¹⁹.

Ordinarily, embalment is not recommended for bodies who died from COVID-19¹⁴ as it is not clear whether embalming is safe to practice. The supply of such infectious COVID-19 bodies for teaching in an academic environment will be catastrophic. Therefore, risk must not be taken at this critical time as research shows many sources of the cadavers are unclaimed bodies. Hence, there is a need to checkmate the safety of bodies that will be used for dissection. According to practice, cadaver dissection involves exploring all the tissues of the body including the visceral that might be lodged with body fluids thereby exposing the dissector to a higher risk of being infected.

We, therefore, recommend that before any cadaver will be acceptable and used for anatomical dissection purposes, the appropriate medical records of such bodies should be requested. COVID-19 screening or test should be conducted on such cadaver, while other infection prevention guidelines that address COVID-19 should be strictly followed. However, recent studies indicated that negative results of laboratory screening may not signify the absence of COVID-19 infection⁴. Therefore, it is advised that laboratory technologists and prosectors in various medical schools should be trained concerning best

infection prevention control practices with an emphasis on COVID-19.

Also, the concentration of formalin, phenol, and ethanol which are the basic chemical components of embalming fluid may be increased during this time as special embalment would be required to guarantee safety. However, if a well-embalmed body is supplied to an academic laboratory, such bodies can be immersed in 5-10% formalin with about 60-70% alcohol concentration or initial storage in coolers at a temperature of about 4 degrees Celsius (4°C) for at least 2 weeks before use. Avoid any form of skin contact with the cadaver as far as possible. The mandatory use of personal protective equipment (PPE) such as 3 ply face masks, non-latex disposable gloves, long sleeve laboratory coat with impermeable aprons, and covered shoes among other laboratory procedures should be strictly adhered to by the students and staff. The widely used range of student to cadaver dissection ratio is between 6:1 to 9:1¹¹, however, during this COVID-19 pandemic, we recommend a ratio of 4:1 to comply with the social distancing protocols. Consequently, this might lead to an increase in the numbers of cadavers to be dissected.

Dissection classes should also be rescheduled in batches to reduce overcrowding in the laboratory. Washing of hands (up to elbow level) with soap and running water or an alcohol-based hand rub or sanitizer according to WHO recommendations should be observed before and after every dissection sessions, as well as proper removal and disposal of all disposables including face masks, hand gloves, and used blades. All removed tissues from the cadaver should be properly placed in the tissue containers. Furthermore, all laboratory equipment should be sterilized periodically and any case of cut, injury, or accident be reported immediately to the personnel or facilitators present. All other laboratory safety precautions should be strictly adhered to avoid accidental disease transmission from cadavers to students before, during, and after dissection. Also, the dissection halls should be well ventilated with natural ventilation and its environment should be decontaminated periodically as at when due.

In conclusion, the risk of contracting infections when handling cadavers is high if all the safety measures are not in place and strictly adhered to. To achieve this, there is a need for collective efforts and contributions from all major stakeholders primarily in the health and education sectors of the nations. The administrators of medical schools and bodies donation regulatory agencies need to work

together to ensure the cadavers supplied to medical schools are certified as COVID-19 free and safe for anatomical dissections. Lastly, the current coronavirus pandemic might be a pointer for scholars to reason and see the benefits in virtual learning, with an emphasis on virtual dissections whether it can be incorporated into the teaching of anatomy in the modern 21st century digital way. This can be done side by side with the traditional wet dissection method if not totally replaced, especially during this COVID-19 pandemic.

REFERENCES

1. Chia T, Oyeniran OI. Anatomy education in Nigeria: Challenges and prospects. *J Contemp Med Educ*. 2019;9(3):61-65.
2. Chia T, Oyeniran OI, Ajagbe AO, Onigbinde OA, Oraebosi MI. The symptoms and stress experienced by medical students in anatomy dissection halls. *J Taibah Univ Med Sci* 2020;15(1):8-13.
3. Memon I. Cadaver Dissection is Obsolete in Medical Training! A Misinterpreted Notion. *Med Princ Pract* 2018;27:201-210.
4. Ravi KS. Dead body management in times of Covid-19 and its potential impact on the availability of cadavers for medical education in India. *Anat Sci Educ* 2020;13(3):316-317.
5. Chia T, Oyeniran OI. Ethical considerations in the use of unclaimed bodies for Anatomical dissection: A call to action. *Ulutas Med J* 2020;6(1):5-8.
6. Dissabandara LO, Nirathanan SN, Khoo TK, Tedman R. Role of cadaveric dissections in modern medical curricula: a study on student perceptions. *Anat Cell Biol* 2015;48(3):205-212.
7. Nurunnabi AM, Ara S, Khalil M, Khalil M. Ethics in dissection of cadaver in teaching and learning of anatomy. *Bangladesh J Bioeth* 2011;2(3):10-15.
8. Habicht JL, Kiessling C, Winkelmann A. Bodies for Anatomy Education in Medical Schools: An Overview of the Sources of Cadavers Worldwide. *Acad Med* 2018; 93(9):1293–1300.
9. Ghosh SK. Human cadaveric dissection: a historical account from ancient Greece to the modern era. *Anat Cell Biol* 2015;48(3):153-169.
10. Gürses İA, Coşkun O, Öztürk A. Current status of cadaver sources in Turkey and a wake-up call for Turkish anatomists. *Anat Sci Educ* 2018;11(2):155–165.
11. Mwachaka PM, Mandela P, Saidi H. Repeated exposure to dissection does not influence students' attitudes towards human body donation for anatomy teaching. *Anat Res Int*. 2016;2016
12. Osuagwu FC, Imosemi IO, Oladejo OW. Sources of cadaver used for dissection at the Ibadan medical school, Nigeria-Analysis of a three-year data. *Afr J Biomed Res* 2004;7(2).
13. Johns Hopkins University and Medicine. Coronavirus Research Centre. COVID-19 Case Tracker. 2020. Available from: <https://coronavirus.jhu.edu/map.html> (Accessed June 23, 2020).
14. World Health Organization. Infection prevention and control for the safe management of a dead body in the context of COVID-19: interim guidance, 24 March 2020. Available from: https://apps.who.int/iris/bitstream/handle/10665/331538/WHO-COVID-19-IPC_DBMgmt-2020.1-eng.pdf (Accessed June 5, 2020).
15. Demiryürek D, Bayramoğlu A, Ustaçelebi Ş. Infective agents in fixed human cadavers: a brief review and suggested guidelines. *Anat Rec* 2002;269(4):194-197.
16. Morgan O. Infectious disease risks from dead bodies following natural disasters. *Rev Panam Salud Publica* 2004;15:307-312.
17. Healing TD, Hoffman PN, Young SE. The infection hazards of human cadavers. *Commun Dis Rep CDR Rev* 1995;5(5): R61-68.
18. www.miamiherald.com. Katie Camero (author). Can you catch coronavirus from a dead body? It's a possibility, researchers say. (Accessed on June 17, 2020). Available from: <https://www.miamiherald.com/news/coronavirus/article242085146.html>
19. Pagat AM, Seux-Goepfert R, Lutsch C et al. Evaluation of SARS-Coronavirus Decontamination Procedures. *Appl Biosaf* 2007;12(2):100-108.