

IMPORTANCE OF CADAVERIC DISSECTION IN LEARNING ANATOMY FOR MEDICAL STUDENTS

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**ABSTRACT**

Cadaveric Dissection has been used for centuries to explore anatomy. The role of dissection in modern medical curricula has been a topic of intense debate. Anatomical education has been undergoing reforms in line with the demands of the medical profession. Despite the rise of modern technology and evolved teaching methods, dissection remains a cornerstone of the anatomy curriculum. Dissection helps to build discipline-independent skills which are essential requirements of modern healthcare setup. Its utility is also reflected in the perception of students who believe that dissection provides them a foundation to develop clinical skills. Objections to the use of cadavers have led to other alternatives including virtual dissection of computer models. The current state of dissection in anatomy is deteriorating. The present study aims to assess the importance of a traditional methods like cadaveric dissection in teaching and learning anatomy at present when medical schools are inclining towards integrated and clinical application of learning methods.

Keywords: anatomy education; cadaveric dissection; medical curriculum; student's perception

INTRODUCTION

The word dissection is derived from Latin word dissecure 'to cut into pieces'. For many centuries, physicians of ancient Greece gained considerable information about the human body and health. Human cadaveric dissection has been used as the core teaching tool in anatomy for centuries. It was practiced in Italy from the 13th century, however, in France, it was officially conducted from the middle of the 14th century. In 1340, human cadaveric dissection was made official in the University of Montpellier, and in 1407 the first sanctioned dissection occurred in the University of Paris.¹

Friedrich Tiedemann; the foundation of the study of the art of operating must be laid in the dissecting room.²

Anatomy is considered one of the cornerstones of medical curriculum and not only basic science, but clinicians also develop their clinical skills. A deep understanding of anatomy is fundamental for safe clinical practice. There has been a steady increase in medico-legal litigation for surgical malpractice. In the UK, between 1995 and 2000,

there was a 7 times an increase in claims associated with anatomical incompetence submitted to the Medical Defence Union. Out of which, 32% of claims against general and vascular surgeons particularly damage to underlying structures.³ Cahill and his colleagues showed that a significant number out of the 80,000 avoidable deaths per year in the US may be due to anatomical errors as well as the doctor's incompetence.⁴ In spite of a report that less than one-third of new residents in surgery have inadequate anatomical knowledge. Numerous medical schools have reduced the teaching time devoted to anatomy: hence, the knowledge of anatomy amongst undergraduate and graduate (medical and dental) students has declined.⁵

The thorny question is why students do not seem to have enough anatomical knowledge to practice safely. The answers are various: ranging from reduced teaching hours to recently developed teaching methods not including compulsory cadaveric dissection in the curriculum.² A recent studies reported that in Australian medical schools

gross anatomy teaching had reduced from approximately 500 hours per year in its former undergraduate medical degree to an average of 52.5 hours in its new graduate medical program.⁶ Gogalniceanu et al. studied 174 first and second year medical students and observed dissection and prosection were to be the most useful methods of learning anatomy (75% of students believed dissection was the single most useful method of learning anatomy), While the least popular was the problem-based learning/computer aided learning.⁷

Cadaveric dissection as a learning medium has been an active area of research in the domain of anatomical education. It highlights the development of discipline-independent skills associated with dissection-based teaching. Literature has shown that number of medical schools have either removed the practical hands-on aspect of dissection in the medical undergraduate curriculum or are seriously considering such a measure on financial or human resource grounds.⁸ The present article aims to assess the impact of cadaveric dissection in anatomical education at present times with a review of the relevant literature. This study also highlights the fact that dissection can impart anatomical knowledge as well as offer other relevant, positive learning opportunities to enhance the skills and attitudes of a future medical studies.

DISCUSSION

1. *Integrated medical curriculum:*

In designing an anatomy center, four principle curricular models may be considered: tradition, integrated, problem-based, and system-oriented.⁹ Integrated curriculum is amalgamation of the concepts of all subjects of basic science, which breaks the barrier between individual disciplines to provide students with better opportunities. In Nepal, the first integrated course was implemented in Institute of Medicine, Tribhuvan University.¹⁰ Most of the curricula for medical education, especially for 1st and 2nd year medical students have been shifted from systematic to integrated.

The Institute of Medicine (IoM) designed the curriculum in such a way that team learning experiences integrate basic medical sciences with clinical disciplines. To conduct integrated teaching based on the organ system, basic science faculty members coordinate periodic intra- and interdepartmental meetings to conduct correlation seminars and problem-based learning. Total number of classes for the first and second year MBBS is 1089 (theory) and 800 (practical). The curriculum does not include hours allocated to an individual subjects.¹¹ In Kathmandu university preclinical science (basic) is divided into I-IV semesters. Anatomy has been given more emphasis in the hours of instruct allotted in KU. Total number of classes

for anatomy is 193 theory and 120 practicals. Self-study time is allotted that includes seminars, tutorial, and extra classes.¹² In Patan Academy of Health Science (PAHS), a curriculum integration module has been developed in Basic Science. The curriculum moves in the context of organ system block with the emphasis on clinical case scenarios. Based Learning (PBL), Clinical Presentation Curriculum (CPC) with small group sessions, as well as Community-Based Learning and Education (CBLE) are the principal teaching learning methods adopted for PAHS MBBS programs.¹³ Meanwhile, looking at the curriculum of BP Koirala Institute of Health Sciences (BPKIHS), it is thoroughly integrated, community oriented, and partially problem-based incorporating the organ system.¹⁴

Institutional goals, objectives, subject content, learning experiences, and assessment are directly affected by curriculum. Anatomy learning in undergraduate education has been in decline for many years. Some suggest that it has fallen below a safe level. Therefore, outlines of the anatomy curriculum should not only focus on theory but also on the hand on practical classes like cadaveric dissection for undergraduate medical students. In an integrated curriculum, the faculty has to follow the sequence of the organ system. This can be sometimes being not "in sync" with how faculty like to teach their subjects.¹⁵ For example, in anatomy, the musculoskeletal system includes more number of lectures and practical classes than that of a other subjects. Faculty have to complete the system within the time allotted to them and in consultation with the system chair. Practical classes are also limited, that is, focused on demonstration bones and prosected specimens. Therefore, most of sessions dissection is not included due to insufficient time and pressure to jump to another system to coordinate with other subjects.

2. *Cadaveric dissection as an educational tool:*

Anatomical education has been undergoing reforms in line with the demands of the medical profession. Amadio reported that cadaveric dissection is the only tool that gives students an appreciation of a natural variety of human structures as opposed to virtual cadavers.¹⁶ Moore in his work "To dissect or not to dissect" delineated the various disadvantages associated with a non-cadaver-based curriculum.¹⁷

S.K Ghosh in his study emphasizes the impact of cadaveric dissection at present when medical schools are inclining towards student-centered, integrated, clinical application models. The article attempts to analyse the merits of technology-based advanced teaching methods in anatomy, which are supplementing cadaveric dissection in modern medical curriculum. At the same time, also tries to highlight the points raised by educators in favor

of continuing with dissection as the primary method of teaching gross anatomy. It highlights the development of discipline-independent skills associated with dissection-based teaching.¹⁸

Asharani SK reported, although dissection is time consuming compared to other forms of learning anatomy. The sequential nature of dissection may be beneficial to study and understand complex anatomical structures like limbs which can be challenging for beginners. His article concluded that the use of dissection in medical training had shown more effective in the retention of intended information. Computer and multimedia should be complementary but not a substitute for dissection.¹⁹

There is an inaccurate impression among educators that many medical schools have abandoned dissection as a teaching tool, however, in reality very few have and many of them have reinstated dissection within a short time.²⁰ Researchers have conducted questioner-based studies among medical students and their attitude towards dissection. Most of the students were found to be inquisitive and relaxed while visiting the dissection hall and believed that dissection was an integral part of the study of anatomy.²¹ About 96.37% of the students agreed that dissection provides the best method for learning anatomy. They are also concerns that the practice of cadaver dissection may remove the fear factor and the urgency to save actual patients since medical students become accustomed to death and suffering.²²

A qualitative study conducted by Lempp KH, stated 7 covert learning outcomes were identified by the students;²³

- Familiarization with the body
- Integration of theory and practice
- Teamwork
- Application of practical skills
- Preparation of clinical work
- Respect for body
- Appreciation of dissection

3. Source of cadaver:

Historically, anatomists have depended on the gallows, jails, or poorhouses as sources of bodies, but the 1960s and 1970s saw the rise of a viable alternative: body donation or informed consent of the deceased during his or her lifetime.²⁴ The sources of human tissue used for medical education and research depend on local legislation, awareness and willingness of the programs and “unclaimed” bodies, that is, bodies of individuals who die without relatives or friends to claim them for

burial or without the means to afford burial. In some countries with a shortage of available bodies, anatomists import cadavers from other countries.²⁵

The International Federation of Associations of Anatomists (IFAA) recommended in 2012 that only donated bodies be used for anatomy teaching and research. However, in many countries around the world, anatomists still depend on bodies that do not stem from voluntary donations by the deceased but, rather, are “unclaimed.” A survey conducted among 71 countries around the world through a broad literature searches reported that most of the Asian countries depend on unclaimed bodies as a source of cadavers. Some of the countries like China, Japan, and Korea depend on exclusive body donation.²⁶

In a contest of sources of cadavers in Nepal, Singh et al. reported medical institutions of Nepal also acquire cadavers from unclaimed bodies for medical learning purposes, but the supply seems to be minimal with increasing demand. The total cadaver: student ratio ranges from 1:10 to 1:25, which clearly shows that many medical students are not having proper opportunities for dissection, which may hamper their anatomical and clinical skills. The study also focused on unclaimed cadavers remaining a principal teaching tool for medical educators, and voluntary body donation has not evolved properly in Nepal yet. We need a proper voluntary body donation act to facilitate medical teaching with the proper motivation of people for this generous gift to further the knowledge and expand the field of medical science.²⁷

To increase public awareness of the crucial role of body donation in medical education, it is essential to speak to the public by all methods possible. Different approaches such as TV, newspapers, testimony, setting up monuments, reports on ceremonies, testifying to dignity of cadavers, and social channels can be used to raise potential questions about bequeathing one’s own body.²⁸

4. Student outcomes related to dissection versus other learning tools:

There have been attempts to undertake outcome comparison of cadaver dissection with other educational tools in terms of student learning, examination performance, knowledge retention, and other aspects of the medical curriculum. Although no single teaching modality was found to be compatible with all aspects of the curriculum, dissection was overall most “fit for the purpose” in meeting learning outcomes.²⁹

Human cadaveric dissection by students was the referred method of teaching to achieve the full set course aims. In conclusion, the study adds to the evidence in

support of dissection as a leading teaching modality in modern medical school anatomy courses. Consequently, educators have suggested that dissection should remain as the principal teaching tool in anatomy. However, in terms of knowledge acquisition, the choice was not so unanimous.³⁰ Students are also of the opinion that the inclusion of 3D learning tools influences long-term retention of gross anatomy material and hence should be considered as a beneficial adjunct to dissection for anatomy courses.³¹ Researchers have noted that virtual reality simulation could be critical in developing basic capabilities in anatomy among students. However, virtual reality needs to be followed by dissection based teaching.³² Dissection is the primary tool for laboratory work in anatomy education, whereas other tools such as prosecting specimens and computer-aided multimedia can be supplementary, particularly for complicated 3D structures to enhance understanding. Clinical relevancy can also be implemented in the dissection laboratory, for example: laparoscopy, basic clinical procedures, or surgical procedures on a cadaver.³³

5. Implication of Dissection-Based Anatomy in present curriculum:

There is enough evidence in the literature that dissection enhances anatomy learning and the findings of previous literatures have helped to consolidate that evidence at a wider level involving students and trainees. Recently, in the past 2-3 decades, several medical schools have reduced or stopped dissection in undergraduate teaching. Despite this, literatures from different countries have shown that cadaveric dissection is still practiced in the undergraduate curriculum in a modified and integrated forms. Today, Africa and the USA are the leading geographic areas where medical schools include cadaveric dissection in their undergraduate curriculum. Studies have reported, in Africa 90% of medical schools and in North and South America a majority of medical schools have dissection in their curriculum. Medical schools, in Asian countries like India, Srilanka, Bangladesh, and China continue teaching anatomy assisted by cadaveric dissection.³⁴ In India, the anatomy curriculum of AIIMS for undergraduate MBBS program following the normal disposition, interrelationship, and gross of various structures in the body, hereby dissection is done by students to the cadavers and were assisted/supervised by a team of teachers.³⁵

In Nepal, despite of many articles on the positive respond of students as well as faculty towards cadaveric dissection, the curriculum is not emphasized on cadaveric dissection for undergraduates. Medical colleges are also not able to give extra classes in routine due to lack of faculty, cadavers, and pressure to complete curriculum.

CONCLUSION

This article presents the importance of anatomy teaching with cadaveric dissection as a crucial part of the medical curriculum for medical students. Based on the literatures reviewed, it is no wonder that dissection plays a major role in the performance of students. The literatures also indicate that many medical schools around the world include dissection as a part of anatomy learning in their curriculum. Consequently, medical practitioners, surgeons, anatomy teachers, and researchers in the anatomical field cannot avoid cadaveric dissection. In Nepal, literatures on student's attitudes towards dissection reported that cadaver dissection is still considered important and indispensable in the study of human anatomy. Universities of Nepal are moving towards integrated, student-centered, community-based, problem-based teaching learning methods. We would like to recommend a dissection-based anatomy curriculum for proper implementation in the future education model.

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