

Students' perception on cadaveric dissection in learning gross anatomy for clinical application: Development of a tool using DELPHI technique

T Chenthuran¹, S Sivaganesh², C Abirami³, J Thujeevan³

¹ Department of Anatomy, Faculty of Medicine, University of Jaffna.

² Regional Directorate of Health Services (RDHS) Office, Jaffna.

³ Teaching Hospital, Jaffna.

Abstract

Anatomy remains key for learning other disciplines in medicine and forms the basis for good clinical practice. Gross Anatomy is an integral part of anatomy curriculum which is taught through different teaching methodologies including cadaveric dissection. This method has many advantages as well as limitations. Since the attendance for gross anatomy practical is compulsory for the students for medical institutions such as that of University of Jaffna, Sri Lanka, the actual perception of students towards dissection is not known. In addition, perception of students towards application of learnt gross anatomy in the clinical setting is important in designing / reviewing the anatomy curriculum. Thus, the main objective of this study was to develop a tool to measure the students' perception on cadaveric dissection in learning gross anatomy for clinical application.

A two round - DELPHI survey was chosen to develop a tool by establishing consensus among experts. Extensive literature survey was carried out to obtain relevant input to prepare the draft of the research tool. The participated experts were professors in anatomy, surgery, English language and medical education. A six – point Likert scale tool was finalized subsequent to two rounds of DELPHI technique, and its subsequent application among thirty recent graduates. Anonymity was maintained throughout the whole process.

Key words: Cadaveric dissection, perception, DELPHI, tool

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Corresponding author

Thurayratnam Chenthuran

E-mail: chen.educ@gmail.com



<https://orcid.org/0000-0003-3289-0899>

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Introduction

Anatomy is a basic medical science remains key for learning other disciplines in medicine and forms the basis for good clinical practice. A general course in this subject, involving dissection of the whole body, should be taught for the first-year medical students. Further, this course should be able to yield sufficient understanding of anatomy to the medical students while addressing its importance and complexities (1). Conventionally, anatomical science in the allopathic medical curriculum comprises the topographical (also known as gross or macroscopic) anatomy, histology and developmental anatomy. The topographical anatomy can be divided into surface anatomy, neuroanatomy, regional anatomy, endoscopic and imaging anatomy (2). The contemporary anatomy curriculum is enriched with relatively newer areas, for example, the genetics (3, 4, 5).

The macroscopic anatomy is taught through different teaching methodologies such as cadaveric dissection, demonstration with prosected specimens and plastic models, didactic lectures / tutorials (chalk and board method, power point presentation etc.), plastinated human bodies, three-dimensional imaging via computer programmes (e.g., virtual dissection models), audio visual materials (e.g., pre-recorded videos on dissection), body painting, and ultrasound imaging etc. (6, 7). As each method has its own advantages and limitations, medical institutions choose methods appropriate for them to teach anatomy subjected to their curriculum, financial allocations, and availability of qualified staff etc. Criteria for body donation established in many medical

faculties of Sri Lanka, if not all, highlights the importance given for cadaver – based education in the country.

Cadaveric dissection

Cadaveric dissection can be described as the “systematic exploration of a preserved human cadaver by the sequential division of tissue layers and the liberation of certain structures by removal of the regional fat and connective tissue with the aim of supporting the learning of gross anatomy by visual and tactile experience” (8). The practice of cadaveric dissection had its roots in 3rd century BC in ancient Greece but disappeared during the Middle ages due to religious and popular beliefs, and subsequently revived in early 14th century in Italy. Since then, its evolution in Europe and United States of America occurred over the centuries (9). Cadaveric dissection is regarded as an essential and valuable tool in the pedagogy of macroscopic anatomy as it permits the students to observe, palpate and move different parts of the human body (10).

Granger (2004) denoted that the “anatomy dissection laboratory is often where the process of professional acculturation is initiated, fostering knowledge, skills, attitudes, values, and behaviors that will enable physicians to function appropriately within their chosen discipline” (11). It provides a superlative opportunity for students to create a three-dimensional mental image on the organization of the human body consistent with gender and age. Cadaveric dissection permits hands on experience and exploration of different body parts (organs / structures,

tissues etc.) and acquiring manual dexterity. The pre-registration house officers (PRHOs) viewed that the cadaveric dissection should form an important part of any medical curriculum (12).

A thorough anatomical knowledge is fundamental to perform clinical examination (such as hepatomegaly, splenomegaly etc.), interpretation of radiographs, and for surgical management. Medical procedures such as pleural aspiration, blood gas sampling, femoral venepuncture also demands basic anatomical knowledge for their safe execution.

The learning experience gained through the cadaveric dissection sessions likely develop many important practical skills and qualities which are required for a future medical practitioner for a safe and efficient medical practice. The advantages of cadaveric dissection include but not limited to: 1. Development of eye-hand coordination, and training on proper use of instruments during dissection sessions tend to develop personal practical skills, for example that of surgical skills (11, 13) in a stress-free environment; 2. It enables teaching of whole-body pathology (14); 3. It is an opportunity to teach moral and ethical issues to the students (14) by addressing their emotional responses towards their cadavers and their first (for many) confrontation with death and dying of human beings (11); 4. Enhancing critical and logical thinking (13); 5. Enabling the students to come to grips with mortality (15); 6. Enabling the students to appreciate the anatomical variations (12) in order to differentiate them from pathological abnormalities (15); and 7. Early introduction to team work (12) enable them to work as a team in their future clinical

practice. In addition, cadavers are also utilized for medical research and to train medical students in medical procedures.

Cadaveric dissection has its own limitations as related to teaching macroscopic anatomy. Apparently, it is not the best choice for teaching certain essential areas, for example, anatomy of skeletal system, muscular system (i.e., when in the contracted state), nervous system (especially the smaller nerves), lymphatic system (particularly lymphatics), and of small or indistinct organs (e.g., the adrenal gland, the parathyroid glands, the pineal gland etc.). Another important constraint is related to studying surface anatomy (14). Moreover, it is a time-consuming exercise which demands a considerable allocation of teaching hours in the busy medical curriculum, and the undesirable effects of preservatives.

Cadaveric dissection in the Anatomy curriculum

The last revision of the undergraduate medical curriculum of the Faculty of Medicine, University of Jaffna, Sri Lanka resulted in significant reduction (25.5%) of anatomy curriculum from 659.5 hours (older curriculum) (16) to 491 hours (revised curriculum) (17, 18). Prior to the curricular revision, anatomy contributed 44.8 credits to the medical curriculum which is approximately 15.9% of the total credits of the overall medical curriculum. Moreover, this (i.e., 44.8 credits) was the highest academic credit offered by an academic department in the said institution. It is noteworthy that the

participants (recent graduates) included in the validation of the tool had studied anatomy in the older curriculum.

The teaching / learning process of macroscopic anatomy in the older curriculum encompasses pre-dissection lectures /discussions, dissection sessions, and post-dissection tutorials. The revised curriculum does involve lectures and tutorials but fails to emphasize the time of delivery in connection with the dissection. Most importantly, in the older curriculum, the practical hours allocated to teach macroscopic anatomy were solely utilized by cadaveric dissection exercise (318 hours). But in the revised curriculum, along with dissection other methods namely “learning through prosected specimen (LPS)” and “small group discussion (SGD)” are also included in the practical hours designated for macroscopic anatomy (222 hours). The didactic lectures on gross anatomy, radiology, and applied anatomy are common features of both curricula.

Attendance for the tutorial (including gross anatomy), and gross anatomy practical is mandatory where students should have at least 80% overall attendance (all four terms collectively - in both categories separately) to qualify to sit for the Phase 1 examination while attendance for didactic lectures including pre-dissection lecture (/discussion) is not considered to determine the eligibility.

At present, Sri Lanka has neither a core curriculum (18) nor a national guideline to standardize the method and period of teaching different components of anatomical science (including cadaveric dissection) among the Universities in Sri Lanka. At this

circumstance, since the attendance for cadaveric dissection was made compulsory for the expected participants of the study, the actual perception of students towards dissection (i.e., interest, views on its advantages, disadvantages, importance of the dissection, alternate methods, allocated time etc.,) is not known. As alternate or complementary methods for dissection are being suggested and / or implemented, it is important to measure the student's perception on cadaveric dissection in learning gross anatomy for clinical application. It will enable the medical educators to review and define the contribution of dissection in the modern medical curriculum for teaching anatomy.

Requirement of a research tool

To our best of knowledge, there is no standardized tool to measure the student's perception on cadaveric dissection in learning gross anatomy for clinical application. Therefore, by employing DELPHI method a six-point Likert scale research tool was developed for such purposes. This tool would be beneficial not only for the medical faculty of the University of Jaffna but also for other medical institutions which follow different curriculums involving various extent of cadaveric dissection. The objective of this study was to develop a tool using DELPHI technique to measure the students' perception on cadaveric dissection in learning gross anatomy for clinical application.

Materials and methods

Extensive literature survey was performed to obtain relevant input for the DELPHI study and based on which draft of the research tool ("draft tool") was prepared. Ethical clearance for the study was obtained from the ethics review committee (ERC) of the Faculty of Medicine, University of Jaffna, Sri Lanka. The study was conducted in Sri Lanka.

In case of draft tool, the format of a six-point level Likert scale was derived where Likert item is coded with a numerical notation assigning 1 to strongly disagree, 2 to disagree, 3 to slightly disagree, 4 to slightly agree, 5 to agree and 6 to strongly agree. It had three main categories; 1. Learning gross anatomy, 2. Reflection of skills and perceptions, and 3. Suggestions. Each category had different number of statements / questions (total of 27) drafted in accordance with the objectives of the study based on the literature survey. Experts

were expected to place their observation on the tool. All the Likert items are open ended in order to accommodate possible comments from the respondents on a particular statement / question and, adequate space was also provided at the end of the draft tool for any other suggestions. All unattended statements were considered as accepted.

The DELPHI method

The DELPHI method, a common technique used to achieve consensus among experts on a specific problem, was used in this study. The structured DELPHI procedure described in the scientific literature (19,20) was adopted in accordance with the objectives of the study to reach consensus among the panelists through the process of information feedback and iteration.

Table 1: Experts selected for the DELPHI technique

Classification	Expertise	Description	Gender	Qualifications
Group 1	Senior anatomists	One expert from three different medical institutions in Sri Lanka	Male: female = 2:1	Professor or Senior Professor or Professor Emeritus
Group 2	Consultant surgeons	Three experts from two different medical institutions in Sri Lanka	All males	
Group 3	Senior academics in English Language	One expert from two different Universities in Sri Lanka	Male: Female = 1:1	
Group 4	Medical educationist	One expert	All males	

Selection of DELPHI panel

The expert panel for the DELPHI technique comprised a group of senior anatomists, consultant surgeons, senior academics in English language and a medical educationist from different state universities in Sri Lanka. The experts were selected based on their expertise in the relevant field considering their academic and professional qualifications, experience in teaching and their research capacity, and other applicable qualifications. Details pertaining to the selected experts are given on table 1.

At the commencement of the study, the request to serve as an expert in the DELPHI procedure was forwarded via the electronic mail (e-mail) to all the potential experts – individually – in order to obtain their consent for participation in the study. Further clarification related to the study was made via email and / or over the phone whenever requested by the experts. All except one expert gave their consent for their participation in the study. Subsequently, suitable replacement was made after obtaining informed consent. Anonymity was maintained throughout the DELPHI study by communicating the participants individually through their respective email address. Provision for feedback and opportunity to revise earlier responses obviously requires that the technique has at least two rounds.

In the first round, the draft of the tool was circulated among the consented experts through e. mail individually (e [electronic] DELPHI survey). The panelists were requested to forward their responses before a stipulated date. However, only 3 out of 9 panelists

responded prior to the date specified. Recirculation of tool was carried out to many of remaining experts in order to obtain the responses. The observations forwarded by the experts were summarized and critically analysed by the investigators. All appropriate opinions or suggestions or recommendations were addressed and considered in amending the tool.

During the second round of DELPHI technique, the amended tool was circulated again among all the experts for their observations, suggestions (if any). The concerns / suggestions / recommendations of all the responded experts were summarized. All the valuable views were considered in revising the amended tool for the development of final (DELPHI) version of the tool.

The DELPHI tool was finalized subsequent to its administration among 30 recent graduates of the Faculty of Medicine, University of Jaffna. Informed consent was obtained from the recent graduates prior to their recruitment in the study. Their valid observations / suggestions were considered in preparing the final research tool (Table 2).

Results

The act (and art) of cadaveric dissection has the potential to deliver anatomical knowledge, practical skills, and moral and ethical values central for the medical profession. Its importance in teaching/learning anatomy has been widely accepted and advocated. But it is not without its limitations. Its known disadvantages, along with reduction in the

Table 2: Tool to measure the students' perception on cadaveric dissection in learning gross anatomy for clinical application

No.	Response	Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
A.	Learning Gross Anatomy						
1.	1.1. Cadaveric dissection in general (performed as a group) enhanced my understanding of gross anatomy						
	1.2. Cadaveric dissection performed by me (in the group) enhanced my understanding of gross anatomy						
2.	Pre-dissection lectures enhanced my learning of gross anatomy						
3.	Cadaveric dissection provided an opportunity to comprehend three-dimensional gross anatomy						
4.	Cadaveric dissection helped me recall gross anatomy that is required to solve clinical problems during the clinical appointments.						
5.	Cadaveric dissection enabled me to obtain the basic skills required in learning surgery						
6.	Cadaveric dissection expanded my understanding of the anatomical basis of traumatic injury						
7.	Cadaveric dissection expanded my understanding of medical emergency procedures						
8.	Cadaveric dissection made medical education interesting for me						
9.	My absence (if any) from a few dissection sessions had a negative impact on my learning of gross anatomy						
10.	Demonstrations during dissection sessions improved my understanding of gross anatomy						
B.	Reflection of Skills and Perceptions related to cadaveric dissection.						
11.	It made me respect the generosity of the individual who donated the body						
12.	I am satisfied with the way it was carried out						
13.	It improved my communication skills						
14.	It improved my abilities to work in a team						
15.	I had experienced great physical discomfort during the cadaveric dissection						
16.	The smell was unpleasant to me						
17.	It made me spend more time to learn gross anatomy compared with other methods						
18.	It was very stressful to me						
19.	It is difficult to correlate the macroscopic features of structures in the cadaver with those of the patients.						
20.	I was worried about the possible health hazards due to the chemicals used as preservatives.						
21.	It made me think about death						
C.	Suggestions related to cadaveric dissection						
22.	It should be completely removed from the medical curriculum						
23.	It should be preceded by pre-dissection lectures						
24.	It should be replaced by lectures aided with visuals						
25.	It should be facilitated by good computer programs (e.g., 3D Atlas, Videos)						
26.	It should be replaced by prosected gross specimens						
27.	It should be considered as the best method of learning gross anatomy						
28.	It should be followed by post- dissection tutorials						
29.	It should be facilitated with prosected gross specimens						
30.	It should be replaced by plastic models						
31.	It should be facilitated with plastic models						

Any other suggestions / comments:

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anatomy teaching hours and introduction of alternate methods, leads to confusion among the contemporary anatomists in determining the best educational tool for anatomy education.

First round

All experts (100%) responded to the first round of DELPHI. An expert stated as “good tool to assess the perception of the students, can be accepted without any modifications”. Two other experts gave suggestions and also indicated as “please proceed and administer the questionnaire” (expert 1) and “looks like an interesting study” (expert 2). Some statements / questions were even criticized as “non-specific” and “very vague”. An expert suggested reordering of questions/ statements along with other observations. The amended tool, irrespective of individual observations, was circulated to all the experts individually.

Second round

For the second round, the response rate was 44.44% (4 out of 9). One expert notified along with his suggestions as “now no need to show me again, proceed with your work” whereas another expert expressed his or her difficulty due to sickness. Available feedback was analyzed and necessary amendments were made to finalize the (DELPHI) tool.

Recent graduates

Thirty recent graduates participated in the DELPHI study. Their valid observations / suggestions were considered in finalizing the tool. As per the observations made in their perfected tools certain modifications were

made, for example, removing open space for individual questions / statements. The tool was finalized (table 2).

Discussion

The finalized research tool (table 2) is organized into three sections: 1. Learning Gross Anatomy 2. Reflection of skills and perceptions related to cadaveric dissection; and 3. Suggestions related to cadaveric dissection. Each section is made up of 10, 11 and 10 statements / questions respectively. The tool follows the force – number Likert scale which avoids the middle response scale (21) which is appropriate for the purpose of the tool, therefore remain unchanged. Adequate space is provided at the end of the tool for any other suggestions / comments.

The instruction for the intended participants, included in the finalized tool (table 2), is as follows: “Dear participant, Thank you very much for your consent to participate in the study titled as “Measure the students’ perception on cadaveric dissection in learning gross anatomy for clinical application by developing a tool and determine the factors associated with students’ perception on cadaveric dissection”. The following self-administered research tool is used to measure the students’ perception on cadaveric dissection in learning gross anatomy for clinical application. Please express your own opinion on the following statements / questions regarding the Gross Anatomy / Cadaveric dissection performed during the Phase 1 (Pre-clinical studies) of the Medical Curriculum of the Faculty of Medicine, University of Jaffna.

Please indicate your single opinion by inserting a (✓) in the relevant cage”.

The Nominal Group Technique (NGT) and the DELPHI method were the two common methods that can be used to attain an expert consensus on a research problem (20). The former method was not considered due to its limitations as related to this study. Thus, the tool was developed through DELPHI method as described. The e-DELPHI method provided opportunity to include experts live across diverse locations in the country. The strict maintenance of anonymity among the experts throughout the study would prevent dominance over others' opinion resulting from professional status, seniority, administrative superiority and strong verbalization of any panelists. It enables the individual experts to change their opinion in the future rounds of DELPHI method based on others opinion without publicly admitting their stand.

One of the advantages of the study is all the experts recruited were professors or senior professors or professor emeritus who are expected to have sufficient knowledge in their area of expertise. On the other hand, response time for giving their consent, and thereafter in presenting their views in both rounds consumed more time than expected for some experts likely due to their academic and / or professional commitments. As this study was based on e-mail communications, their non-verbal reflections could not be recorded unlike other qualitative methods (22).

Conclusion

A six – point level, Likert scale, self-administered research tool was prepared through two rounds of DELPHI study, and its subsequent administration among thirty recent graduates. This tool can be used to measure the students' perception on cadaveric dissection in learning gross anatomy for clinical application at medical institutions where cadaveric dissection is at least a part of curriculum.

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