

Research Article

Methods to learn human anatomy: perceptions of medical students in paraclinical and clinical phases regarding cadaver dissection and other learning methods

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ABSTRACT

Background: Though the medical students learn human anatomy during their first year of curriculum, the application of the anatomy knowledge truly starts when they enter the preclinical and clinical phases. Therefore, it is more important and worth knowing from paraclinical and clinical students that which methods of learning gross anatomy during their first year curriculum were useful to them.

Methods: The present study was based on the feedback through a 16-item questionnaire inquiring into the role of cadaveric dissection and other methods in learning human anatomy from the medical students in paraclinical and clinical phases (2nd year, 3rd year and interns), who have undergone the process of cadaveric dissection as a part of anatomy course in their first year of medical education.

Results: Most of the respondents gave positive feedback about the cadaveric dissection as learning methodology, however around 20% students also gave a feedback about the limitation of this method as time consuming when the course duration is less while around 85% felt the need of less crowded dissection tables for better understanding. About 25% students also said that they understood anatomy better with other methods than dissection. More than 70% students expressed that more importance to living and radiological anatomy was needed in the curriculum to benefit them in the future clinical practice. About one fourth of the students felt that complete replacement of cadaveric dissection by combination of other methods to learn anatomy is possible, especially when the newer technologies can be used to understand the subject.

Conclusions: Perception of knowledge by an individual student is different based on the individual primary mental abilities. Therefore, some individuals may show better learning by particular methods. Hence a blend of different methodologies to teach a subject is helpful for majority of the students. In the teaching of human gross anatomy too, a combination of different methods has been in use. However, in the era of decrease in course duration, high "student:cadaver ratio", and easy availability of newer technologies, there is a need to review the priorities and preferences of the methods or to find out different ways to use the existing methods to increase their effectiveness.

Keywords: Dissection, Learning, Anatomy, Perception, Virtual

INTRODUCTION

It is fundamental to have a thorough understanding of human anatomy to become a medical doctor. Different methods to teach human gross anatomy in the first year

curriculum include cadaveric dissection, didactic lecturing, drawing/showing pictures and animations, demonstrations on dry skeleton, prosected body parts, mannequins, models, plastinated specimens and radiographs; and living or surface anatomy. Diagrams or photographs of bones, muscles, vessels, nerves, organs

and other different types of tissues in the body in the textbooks and atlases help the students to understand and correlate the knowledge they have acquired in the classrooms and practical rooms. Apart from these usual methods, evolution in the technologies in the recent past has introduced newer ways to learn/teach anatomy, such as animations and dissection videos with elaborative commentary or explanatory text along with them, and relatively still newer techniques which allow cadaverless dissection with the help of simulator software or virtual cadavers.^{1,2}

Till date, dissection is mandatory for the first year medical course in most of the medical colleges-in view of giving hands-on experience to the future doctors, but for which medical colleges have to make arrangements to get adequate number of cadavers per year. That is why the medical colleges have been constantly under pressing need of cadavers and consequently face the problem of scarcity of the cadavers. Number of unclaimed bodies are most of the time insufficient and in spite of awareness regarding body donation, the “student: cadaver ratio” has not been very satisfactory in many medical colleges.³ Additionally as the teaching hours for anatomy have also been constantly reducing, the time available for students to dissect, explore, and understand the anatomical regions has also been reducing and the purpose of ‘hands-on experience’ is not being fulfilled.^{4,5}

With this background, some questions are arising and have been discussed by many researchers and educationists. For a basic medical graduate is it really necessary to dissect a cadaver? Is the actual available time during the first year of course sufficient for reading, dissecting, and understanding the whole of the human body? Are not other methods sufficient to gain enough knowledge of gross anatomy? Is it possible to completely replace this traditional and long-proven method of cadaveric dissection? If the projected specimens, textbooks, atlases, models, and the newer technologies are at hand, how much is the role of cadaveric dissection? Do the newer technologies have a potential to replace hands-on experience of cadaveric dissection? If the medical doctors are going to examine/treat the living beings, why the ‘living anatomy’ has a minor role in the curriculum of human gross anatomy?

Though the medical students learn human anatomy during their first year of curriculum, the application of the anatomy knowledge truly starts when they enter the preclinical and clinical phases. Therefore, it is more important and worth knowing from paraclinical and clinical students regarding how far and which methods of anatomy learning during their first year curriculum were useful to them during actual application.

Hence, the present study tried to get the views of paraclinical and clinical students including interns regarding various issues pertaining to learning human anatomy. Their perceptions would be helpful to clarify

the role and limitations of different methods to learn and understand human anatomy.

METHODS

The present study was based on the feedback regarding the role of cadaveric dissection and other methods in learning human anatomy from the medical students in paraclinical and clinical phases (2nd year, 3rd year and interns), who have undergone the process of cadaveric dissection as a part of anatomy course in their first year of medical education, through a 16-item questionnaire. The study was done in the period of August 2014 to July 2015. Total 304 respondents completed the questionnaire. They were asked the questions pertaining to five major issues.

1. How much is the role of dissection in learning human anatomy?
2. What are the limitations of learning human anatomy by dissection?
3. What are the perceptions of students regarding the actual process of dissection?
4. Is it possible to understand the subject by methods other than dissection?
5. What possible improvements could be done for better understanding of anatomy for a future doctor?

RESULTS

All the 304 (147 males and 157 females) individuals (including second and third year MBBS students and interns) completed the 16-item questionnaire. Four individuals filled it incorrectly so only data of 300 respondents was taken into consideration. The age group ranged from 18 to 25 years. The results for the inquisition of five different aspects were as follows:

Need and usefulness of cadaveric dissection in learning human anatomy or otherwise

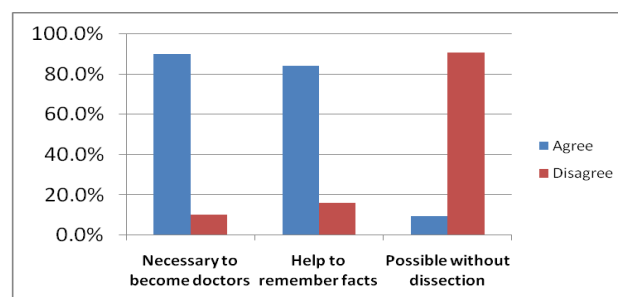


Figure 1: Student perceptions: need and usefulness of dissection or otherwise.

When asked about necessity and usefulness of cadaveric dissection as a part of anatomy course, 89.8% of the respondents thought that it is highly necessary (indispensable), 84% thought it is mostly necessary as it is helpful to remember facts of anatomy, while 9.3% of the

respondents thought that it is possible to learn anatomy without doing dissection (Figure 1).

Limitations: Actual process of dissection.

When they were asked about their experiences and perceptions about the actual process of dissection, most of them were in favor of it, but 18.7% felt it was an unpleasant experience, 17.8% thought it was time consuming, 9.8% said they were scared to dissect a cadaver, while 13.8% did not enjoy the dissection. One more perception was about number of students per dissection table in which 84.4% felt that they would have preferred less number of students per table (Table1).

Table 1: Student perceptions: actual process of dissection.

Perceptions: actual process of dissection	Agree (%)	Disagree (%)
Unpleasant experience	18.7	81.3
Time consuming	17.8	82.2
Scared of dissection	9.8	90.2
Enjoyed dissection	86.2	13.8
Prefer less students per table	84.4	15.6

Interest in performing dissection

While responding to the questions pertaining to interest in performing the actual dissection, only 8.9% said that they would have liked to completely skip dissection sessions, 19.6% said they would have preferred watching the dissection rather than doing it themselves. When they were asked about the students around them in the dissection hall, 70% felt that many of the students around them mostly watched rather than did the dissection themselves (Figure 2).

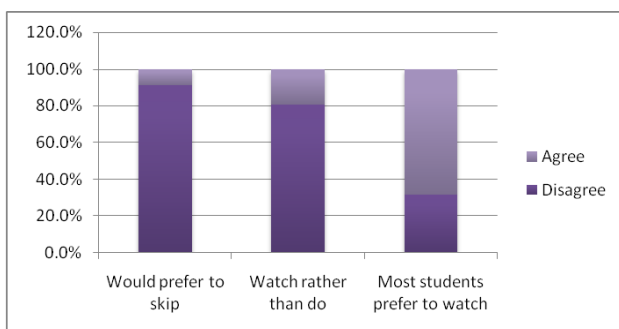


Figure 2: Student perceptions: interest in dissecting.

Perceptions about methods other than dissection

The questions pertaining to methods other than dissection covered perceptions about prosected parts and methods such as textbooks/atlasses/models. Use of prosected parts was thought to be enough to appreciate anatomy (as compared to dissection) by 17.3% students, while 25.8% said that as compared to actual dissection they understood

anatomy better with the textbooks/atlasses/ models. As much as 23.6% students thought that for learning human anatomy, complete replacement of dissection by combination of methods other than dissection was possible (Figure 3).

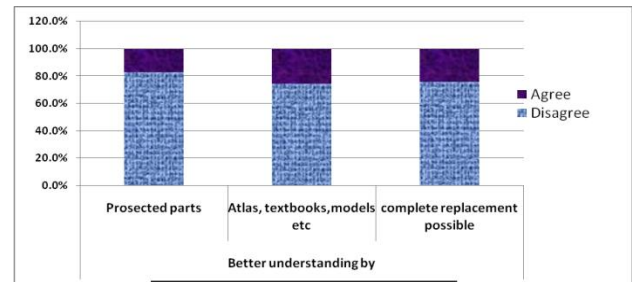


Figure 3: Student perceptions: methods other than dissection.

Possible improvements in methodology of learning anatomy

Regarding the possible improvements in methodology of learning anatomy, the students were asked about the number of individuals working on a dissection table as well as importance of living anatomy and radiological anatomy. A large number of respondents (84.4%) gave preference to cutting down the number of individuals working per dissection table. The need for increasing the importance of radiological anatomy was stressed by 68% respondents; while 89.8% of them appreciated that living anatomy should be given more importance than what currently exists in the present anatomy curricula (Figure 4).

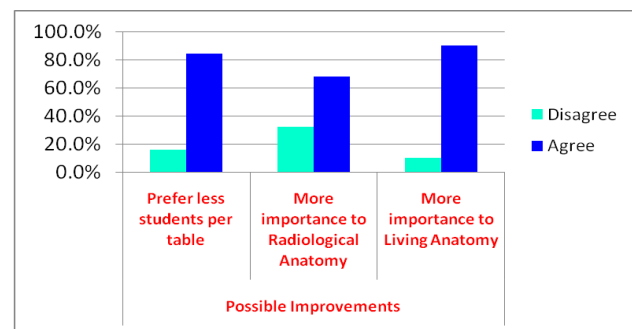


Figure 4: Student perceptions: improvements in methodology.

DISCUSSION

There was tremendous importance of cadaveric dissection for learning human anatomy in the ancient times, which was obvious as there was no other method available to understand human anatomy in those days. There is a long history of use of dead bodies to gain knowledge of anatomy, which dates back to more than 2500 years.⁶⁻⁸ In those days cadaveric dissection was the only way to observe what is beneath the skin. Through dissection,

medical students could study the size, shape, color, texture, and spatial orientation of the body parts.^{9,10} The process of dissection helps in the development of cognitive anatomical knowledge and the appreciation of three-dimensional relationships and anatomical variability-making it a foundation for study of other disciplines where knowledge of structure is essential.¹¹ So learning human anatomy by cadaveric dissection is a traditional and time-proven method.

Even in the present study majority of respondents appreciated the importance of dissection; however, almost one fifth of them felt that dissection is a time-consuming activity. In the past the students were getting relatively more period to dissect and comprehend the anatomical region, which is necessary if anybody is trying to understand the anatomical relations by dissecting it layer by layer. First year medical students are unaware of the detailed human anatomy and at the same time they are also learning the process of dissection, hence proper theoretical discussions and demos before the dissection sessions of the region help them to dissect it methodically without distorting the region/organ and then to understand the proper location, morphology of the organs and relations in that region. This needs more time than what is available in the present curriculum. Over the years, total time provided for the course of anatomy has been reducing. Therefore despite appreciating the importance of dissection, it is logical when the respondents in the present study expressed that providing insufficient time for dissection does not give its full advantage. Due to this background, around one fifth of the respondents expressed that dissection is time-consuming as compared to the knowledge gained by it and that they would have preferred more use of other means like demonstrations on prosected parts, use of textbooks, atlases and models.

The respondents also expressed that they would prefer less number of students per table. It is obvious that presence of large number of students per dissection table decreases the opportunity for actual dissecting and observing the parts and learning through the 'hands-on' experience. With an explosion in the number of new medical colleges in last few decades in many parts of the world, demand for cadavers for dissection has also increased. The ideal "student:cadaver ratio" is supposed to be 10:1, whereas the existing average ratio is 20:1 (range: 8:1 to 50:1).³ A crowded dissection table adversely affects the interest and enthusiasm in dissecting and learning. If the greatest value of dissection is in the active learning, 'hands-on' experience, and self-discovery during learning, then the current situation is in an exactly opposite direction.¹¹

Cadaveric dissection is a mandatory part of the anatomy course in most of the medical colleges. The medical college entrants who want to become doctors are usually aware of the fact that they will have to dissect the human dead body during the first year of their course as they

know this is a traditional method and has been a part and parcel of anatomy learning. So it is not surprising that most of the students by and large accept this mode of teaching. The same thing is reflected in the feedback of the respondents in the present study. However, it was found that about 10 percent of respondents expressed that they felt scared to dissect a dead body, while for closer to one fifth of the respondents dissection was an unpleasant experience. Emotional impact of dissecting a human dead body in terms of extreme anxiety and psychological disturbance has been mentioned in literature. The characteristics of the cadaver in terms of its appearance (color and texture), lack of mobility, and smell, and the concern about health/safety issues while handling cadaveric material have been found to be the reasons for such emotional reactions.¹¹ When the respondents were asked about their interest in actual performance of dissection, only one fifth of them said that they would have preferred to just watch rather than actually do the dissection, and majority of them (more than 80%) said that they preferred to do the dissection. Paradoxically, when they were asked about the behavior of the students surrounding them in the dissection hall, as high as 70 percent recorded their observation as most of the students preferred to watch the dissection and very few of them were enthusiastic about doing the dissection themselves. Thus it was surprising and interesting that almost 80 percent of them said they preferred to actually dissect rather than just watch; 70 percent expressed that most of their colleagues preferred watching the dissection rather than actually doing it. When majority of the respondents (80%) expressed preference for doing the dissection, it is an expression of social desirability bias.¹²

The findings of the present study relate to the inadequate time provided for the first year anatomy course and crowded dissection tables as the plausible reasons for possible disinterest in actually doing the dissection. These reasons also reflected in almost one fourth of the respondents saying that they understood anatomy better by other methods than by cadaveric dissection.

One must appreciate that whatever may be the method of learning, the educationists/teachers are always more concerned about better understanding of human anatomy by the students. Some researchers have conducted studies in past to compare between cadaveric dissection and prosection as methods to understand and recall human anatomy, where they found a better/equal performance of the students and in addition they found the prosection to be time saving.¹³ A study in New York University College of Dentistry recommended the use of plastinated specimens, which are supposed to have a life span of twenty years or longer.¹⁴ A study in South Carolina School of Medicine, US concluded that in this era of course-size reduction in medical schools and the need to curtail the costs, it is better to adapt a curriculum design that explores additional mechanisms of study that may reduce the students' dissection time while increasing their time spent in actual study.¹³ An interesting article about

anatomy teaching said that dissection may not be the best means by which students can acquire and retain anatomical knowledge, and to-date none of the studies demonstrated that long-term retention of anatomical knowledge is an outcome of dissection. About the argument that the process of dissection gives the so-called actual feel of the human body in terms of gaining touch-mediated perception and fine-motor control, the article points out to the better possibility of development of these skills by actual palpation, percussion, and auscultation of the living human body rather than cadaveric dissection, and that these touch-mediated perceptions and motor skills may be fostered in the clinical skill environment. Moreover, in the situations of high “student: cadaver ratio”, it is very unlikely for the students to get an opportunity to dissect sufficiently in terms of development of such skills.¹¹

In the present study, almost 90 percent respondents felt that as future doctors, living anatomy should be given more importance in the curriculum. Living anatomy helps in better understanding of musculoskeletal system (especially movements of muscles and joints), superficial structures/landmarks and locations of organs/parts/structures which are palpable. This definitely has more clinical relevance for the students, who will be going to examine the patients (living beings) as practicing doctors. Similarly, almost 70 percent of the respondents appreciated that the radiological anatomy should be given more importance. There has been continuous rise in the use of radiology/imaging in clinical medicine. Almost every day physicians/surgeons make use of radiographs to see inner anatomy of the patients through images ranging from plane radiographs of limbs/chest/head etc, special X-rays (e.g. barium meal, nephrogram etc) to MRI and CT scans. Hence, using radiographic material to teach anatomy will be of great value.

Almost one fourth of the respondents in the present study expressed that complete replacement of cadaveric dissection is possible if other methods are coupled with newer technologies like dissection videos, virtual cadavers (anatomage tables), and holograms. It will not be surprising if this becomes a reality, since the speed of technology is at its peak during the 21st century. Compressing the time period of anatomy course and high “student: cadaver ratio” shall be the forcing factors for adapting to newer technology.

CONCLUSION

Instead of using a single method, application of different methodologies to understand a subject is a very common thing. Perception of knowledge by an individual student is different according to his primary mental ability, and so such a blending of methodologies is helpful for majority of the students. While teaching human gross anatomy as well, a combination of different methods has been used. However, in the era of reduction in course size, high student: cadaver ratio, and easy availability of

newer technologies, there is a need to review the priorities and preferences of the methods or to find out a different way to use the existing methods to increase their effectiveness.

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