

# Cadaver Prosection Significance in Medical Field: Analytical Survey of Anatomy Pedagogy

Nadeem Baig<sup>1</sup>, Syed Meesam Iftikhar<sup>2</sup>

## Abstract

**Objective:** To determine the effectiveness of dissection as a useful pedagogy in the field of anatomy through assessment of views of respondents.

**Methods:** A cross-sectional study was carried out in the anatomy department of a private and a public sector college for a period of twelve weeks during the year 2018. A total of 135 participants were recruited in this survey. The nature of participation (regular or irregular) in comparison was used as the predictor variable. The average scores for each item were calculated and compared between the participants at dissections using Mann-Whitney's U test. Likert-style survey was designed for evaluation. The IBM SPSS statistics version 21 was used for the analysis of data.

**Results:** A large number of participants overall strongly supported the version that a dissection program should be essentially inducted into the curriculum; viewed non-participation at dissection sessions as to be disadvantageous in terms of their learning repertoire. Seventy eight percent stated it deepens understanding of anatomy as a subject. Around 80% of the participants preferred dissection over other tools of learning, whereas 67% agreed that it develops 3-dimensional structural approach; also agreed with the time allocated for dissection is sufficient for learning (57%). Besides this, a minority of respondents put up a negative perception in terms of dissection being time consuming (36%), stress inducing (18%), boring (20%), and difficulty in finding out structures was also reported (43.3%).

**Conclusion:** The use of dissection in undergraduate medical education as part of anatomy pedagogy may develop a useful golden opportunity for students to work on additional learning objectives such as professionalism, manual dexterity, ethics, teamwork, self- and peer evaluation.

**Keywords:** anatomy, teaching, cadaver, curriculum, dissection.

**IRB:** Approved by Ethical and Scientific Review Committee of Karachi Medical and Dental College. Dated 4<sup>th</sup> September, 2018.

**Citation:** Baig N, Iftikhar SM. Cadaver Prosection Significance in Medical Field: Analytical Survey of Anatomy Pedagogy [Online]. *Annals ASH KM&DC* 2019;24:.

(ASH & KMDC 24(2):62;2019)

## Introduction

The subject of anatomy and its horizon is expanding day by day in the realm of health and related biomedical disciplines. Traditional educational format based on regional and structural anatomy taught in lectures and gross dissection classes

has been replaced by a multiple range of study modules, including computer-assisted learning, problem-based learning (PBL), plastic and 3D-printed models. An unresolved question in modern anatomical teaching is the validity of different anatomical pedagogies exercised in terms of their effectiveness in combination with dissection versus other tools being extensively executed in biomedical field deferring dissection<sup>1-4</sup>. The prosection is a type of dissection of whole or part of a cadaver (human or animal) under expertise of experienced teachers of anatomy in order to demonstrate dissected body parts, structures to the students; in doing so the students later on participate and become part of the dissection process<sup>5</sup>.

<sup>1</sup> Department of Anatomy,  
Karachi Medical and Dental College

<sup>2</sup> Department of Anatomy,  
Jinnah medical and Dental College

**Correspondence:** Dr. Nadeem Baig  
Department of Anatomy,  
Karachi Medical and Dental College  
Email: baig\_nadeem@yahoo.com  
Date of Submission: 6<sup>th</sup> February 2019  
Date of Acceptance: 22<sup>nd</sup> July 2019

The cadaveric dissection has been holding a pivotal position in learning paradigm of anatomy since decades. However, with the passage of time the emphasis on this teaching approach has been drastically turned down to a level of elimination<sup>6</sup>. With the advent of newer learning and teaching pedagogies such as problem-based learning (PBL), new sets of communication skills, bioinformatics and a bridged curricula have necessitated an abrupt reduction in space allocated for dissection in a typical five-year undergraduate medical program<sup>7,8</sup>.

The debate regarding anatomy laboratory teaching approaches is ongoing and controversial. To date, due to generalized methodological weaknesses with lack of summative empirical evaluation only speculative conclusions have been drawn out so far in this regard. Through a holistic survey with contextual analytical work, the present study has been developed, data has been gathered from medical colleges of Karachi operating in private as well as public sector domain in order to develop literature more objectively as to verify the effectiveness of prosection as part of anatomy education. Cadaveric workshops are conducted widely in the United States and appear to be popular with trainees. The Human Tissue Act (2004) permits operative procedures on cadavers thus facilitating surgeons in the United Kingdom to adopt these procedures. The Royal College of Surgeons, England has established a cadaveric workshop, the Wolfson Surgical Skills Centre. However, only 674 cadavers were donated to British medical schools in 2005. In majority of medical colleges, all aspects of anatomical teaching are discarding dissection. They instead utilize medical imaging, live models, pathology lectures and radiologist-lead sessions to teach anatomy in the context of clinical scenarios<sup>9</sup>. A number of interactive studies are attempting to prove the superiority of one method over the other though yet usually inconclusive; some of the methods at a non-dissection based medical school, have found deficiency of prosection which would be useful in order to fill the gap<sup>10</sup>. Despite serious concerns from older generations of doctors, the conse-

quence of removing dissection from the medical curricula does hold water. In fact, a multitude of methods have been tried out to bridge up this gap<sup>11</sup>. However, studies and first-hand evidence still showed students' keenness to augment their knowledge by utilizing methods involving cadaveric prosection.

Anatomy is introduced now as to be the language and the basis of clinical medicine in the light of modern medical curricula<sup>12</sup>. The discipline of anatomy underpins the study of physiology and pathology as well as a host of other clinical specialties including clinical medicine, surgery and radiology. Thus, a thorough knowledge of anatomy has become imperative for crucial understanding of medical skills eliciting a clinical history, examination as well as clinical reasoning that would contribute to diagnostic acumen and patient management.

The shift of emphasis from conventional medical curricula to newer/modern teaching and learning approaches has often resulted in omission with significant reduction of cadaveric dissections. The objective of this study was to evaluate perception of medical students as well as of the teachers of anatomy with respect to this pedagogy whether it should be continued as a significant tool of learning.

### Subjects and Methods

It is a cross-sectional study design. The students of pre-clinical 1<sup>st</sup> year MBBS and teaching faculty of anatomy department were included whereas, 2<sup>nd</sup> year students and other departments were excluded. The regularity and irregularity was used as the predictor variable between two groups. It is already mentioned that participants were divided into two groups on the basis of attending and doing dissection (prosection) in regular or non-regular manner. In this context, a number of other studies have already been published with more or less similar sample size<sup>14,23</sup>. Mann-Whitney's U test was applied for statistic calculations. The 1<sup>st</sup> year pre-clinical medical students of MBBS as well as the teaching faculty of anatomy department of Karachi Medical and Dental College (KMDC) and

Jinnah Medical and Dental College (JMDC) participated in this program. The instructors/demonstrators, professors, associate and assistant professors of the anatomy faculty along with students together worked in a combined fashion prosected limbs of cadaver. The nature of participation (regular or irregular) was used as the predictor variable. The students were permitted to handle, discuss and dissect the specimens under the supervision of teaching faculty members. At the end of the programme a 16-item questionnaire was distributed amongst the regular and irregular attendees of the dissection program. A debriefing questionnaire was completed by the respondents.

This study was initiated as a pilot project during the year 2016, and later on conducted as part of routine anatomy program evaluation following completion of twelve weeks prosection study of upper and lower limbs by the end of year 2018 in two well recognized medical colleges of Karachi operating in private and public sector respectively. The aims of this study were to assess and compare the views of respondents in terms of the importance of dissection as an effective educational learning pedagogy. In this context a Likert-style survey was designed, comprising of 16 questions, utilized for evaluation of the dissection paradigm in the light of previous experiments<sup>13,14</sup>. The questionnaire covered positive and negative aspects of experiment along with a brief comparison with other forms of learning as well. Sixty percent attendance of the scheduled sessions was mandatory for the participants.

The IBM SPSS statistics version 21 was used for the analysis of data. The average scores for each item were calculated and compared between the participants at dissections using Mann-Whitney's U test. The nature of participation (regular or irregular) was used as the predictor variable and the positive and negative items that were found to be significantly different among the two groups, according to Mann-Whitney's U test, were separately entered as predictor variables. The alpha value was set at 0.05 for all analyses.

The ethical approval for this study has been taken by the Ethical and Scientific Review Committee of Karachi Medical and Dental College.

## **Results**

A total of 135 participants completed the 16-question survey instrument. This corresponds to 38.9% of the total number of students enrolled in the year 2018. Out of this, 102 participants indicated that they attended the dissection sessions regularly while 33 of them indicated they had not attended regularly (attendance at less than 50% of sessions). It was also noted that participants responses to most of the items in the survey instrument were significantly different between those considered regular against the non-regular attendees during dissection session. (Table 1)

A large number of participants overall strongly supported the version that the dissection program should be essentially inducted into the curriculum; viewed non-participation at dissection sessions to be disadvantageous for their learning. The majority of students either agreed or strongly agreed with survey proposition items that manifested positive perceptions toward cadaveric dissections program as to get prosected original body specimen. (Fig.1) Interestingly, 58% of the respondents agreed that it helps in recall, identifying the structures directly substantiate memory mechanism. Seventy eight percent stated it deepens understanding of anatomy as a subject. About 56% participants appreciated this tool as to be invoking basic surgical skills.

Around 78.8% of the participants preferred dissection over other tools of learning, similarly (67%) were of the view that it develops 3-dimensional approach toward structures; also agreed with the item time allocated for dissection is sufficient for learning (57%). Side by side a minority of respondents put up a negative perception in terms of being time consuming, (36%) stress inducing (18%), malodorous (60%), and difficulty in finding out structures (47.3%). (Fig. 1)

Table 1. Comparison of perception about dissection between regular and irregular attendees

POSITIVE OBSERVATIONS	RA Mean ± SD	RA Mean ± SD	
Makes learning easy and fast	3.98 ± 0.59	4.23 ± 0.68	0.002
Prefer dissection classes over other forms of learning	3.78 ± 0.87	4.74 ± 0.76	<0.001
Improve my ability of recall	2.92 ± 0.81	3.42 ± 0.91	0.058
Develops three-dimensional approach of structures	3.04 ± 0.81	4.15 ± 0.88	<0.001
Helps better understand physical examination	3.11 ± 0.92	4.20 ± 0.79	<0.001
Helps manoeuvring basic surgical skills	3.06 ± 0.81	3.92 ± 0.96	<0.001
Time allocated for dissection is adequate	2.91 ± 0.80	3.45 ± 0.91	0.067
Invokes basic know how about trauma	3.25 ± 0.91	4.22 ± 0.78	<0.001
Builds up empathy, care toward patient	3.21 ± 0.98	3.91 ± 0.97	<0.001
NEGATIVE OBSERVATIONS	RA Mean ± SD	RA Mean ± SD	p-Value
Ample time consuming	3.54 ± 0.90	3.12 ± 1.12	0.083
Demands a lot of physical work	3.64 ± 0.11	3.09 ± 1.06	0.026
Do not like the smell	3.75 ± 0.93	2.79 ± 1.08	<0.001
Mentally stressful	2.88 ± 1.26	2.13 ± 0.97	0.002
Bored with the way it is carried out	4.14 ± 0.94	3.41 ± 1.20	0.004
Difficult to reach out structure	3.87 ± 0.95	3.08 ± 1.09	<0.001
Dissection should be replaced by good computer programs	2.69 ± 1.14	3.08 ± 1.05	0.089

RA, regular attendee (n=102); INRA, irr-regular attendee (n=33).

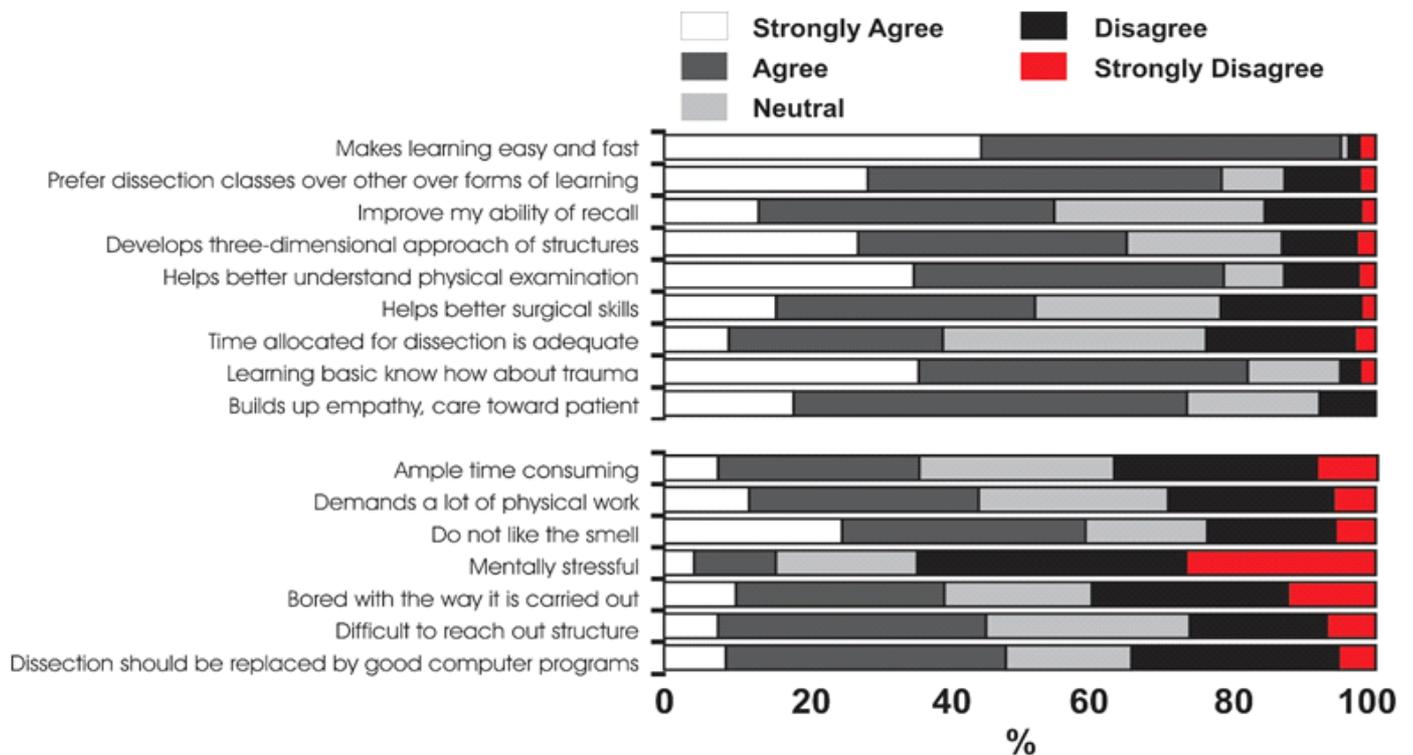


Fig.1 Participants perception about dissection

## **Discussion**

Anatomy has a cornerstone position in bio-medical disciplines; nevertheless, it is observed in the past few decades that there has been a gradual decline in one of its pedagogy i.e. dissection which has been dedicated for study since decades, lately taken over by other tools<sup>16-18</sup>. Different approaches and pedagogies have been worked out including didactic lectures; practical sessions based on models, other newer methods such as 3D models and interactive computer-based software, body painting, radiological images and holograms have become incorporated in the latest designed curriculum<sup>19-22</sup>. The students have far greater access to educational resources in today's world. They tend to use YouTube and other more dedicated anatomy teaching websites such as Funky Professor, as a source of information and great number of students found anatomy videos beneficial to their anatomy learning. In fact, these videos utilize anatomical medical imaging, plastic models and diagrams to maximize understanding of 3D structures of cadaveric specimens. Although the kinaesthetic aspects of learning through dissection is not the case here. However, kinaesthetic experiences may assist students in future endeavours during early surgical training or practical tasks undertaken by doctors in their beginning foundation phase. The variability and intricacies of the human body is highly compromised without direct dissection though virtual models do have their own utility adjunct to other methods of learning. These electronic models permit students to isolate structures, appreciate zooming, rotating and transecting them in order to determine anatomical morphology and relationships. However, these plastic adjuncts do not provide the true physical textures of human anatomy.

The design of the questionnaire used in our program helped developing a reliable index toward the usefulness of this pedagogy. The current study reveals important findings from the opinion with rational assessment on behalf of medical students and anatomy department professionals thus uplifting the perception toward prosection. The positive and negative aspects of anatomical prosection in under-

graduate medical program have been highlighted. The overall majority of participants held positive view points about the usefulness of cadaveric dissections which is an effective pragmatic approach toward structural exploratory paradigm. They have suggested that it makes learning easy and fast going, improve their ability of recall and builds up empathy, care toward patient. A study undertaken at the University of Sydney (where by dissection is not part of anatomy teaching) assigned 29 students to a 34-day full body dissection course<sup>23</sup>. Arguments against dissection based on both the practical utility of obtaining cadavers and to pedagogical learning were taken into account. Faculty of surgery and anatomists guided and assisted students in identifying structures at regular intervals throughout up to one month during the course. The outcome of this study revealed that students' anatomical knowledge was markedly improved on completing the course. The authors suggest that dissection must remain an integral component of anatomy pedagogy. Similarly, the students at Peninsula and University of Melbourne are like minded manner agreed that dissection would be beneficial from all four directions.

Anastakis et al considered cadaveric training to be of benefit for surgeons of all levels, from junior trainees to experienced surgeons learning new techniques and declared cadaver models as the gold standard for technical skills training as they most closely mimic the anatomy of live patients<sup>24</sup>. The cadaver model does seem to have value in allowing trainees to practise a procedure before performing it live and to make mistakes in a safe environment.

Anatomical dissection can be incorporated as harmonious blend with current trends in medical education. The regular and irregular attendees proposed that basically it is an active, student-centred exploratory way of learning, foster better surgical skills at early stage. This inherent challenge of dissection is very likely to facilitate critical thinking thus facilitating further improvement in terms of physical and mental skills solving problems and

overcoming obstacles. This is however recommended that before undertaking dissection the students are required to have got exposure adequately of other modes of learning such as introductory lectures, pro-section and model-based sessions etc, that will definitely be highly supportive contextually.

Majority of the participants (Fig 1.) perceived this experience of human cadaveric dissections as pro-section makes learning anatomy more interesting, that allows students to grasp a clear natural visuo-spatial picture of the organization of human body, experience the texture of human tissues, while learning the normal and compare the normal versus pathological. Through this dissecting experience one learns empathy toward human body thus an effective physician patient relationship, professionalism and medical ethics are incorporated. It is also vital that an instructor/teaching faculty should tend to work up appropriate interaction with students.

Similarly, respondents concluded that it also serves as a mode of enhancing respect and regard towards the human body. Arnold Palso supports this view and accentuates benefits of a dissection program by developing a relationship between student and cadaver donor which is signified as model of clinician-patient relationship at the very early stages of a developing medical student<sup>25,26</sup>. We recommend that medical students must be exposed to opportunities that nurture professional ethics imperative for medical practice thus, dissection bestows our students with an invaluable opportunity to learn to be appreciative of the act of donation, behave respectfully and develop a sense of compassion and empathy towards suffering.

Many hands-on workshops reports also substantiate the utility of cadavers in the light of trainees' attitude who were getting training in laparoscopic techniques<sup>27</sup>. Our study results are well in match with the survey in which trainees' attitude was assessed with the help of a questionnaire, a 5-point Likert scale. Fresh cadavers were used to practise cholecystectomy, appendicectomy,

intestinal explorations, mesenteric lymph node biopsy and varicocele vein occlusion. The large percentage of participants were inexperienced in laparoscopic surgery. All participants signed it appropriate for understanding surgical anatomy, expressed satisfaction with the cadaver as a training model. In the context majority of anatomy faculty members commented it as a valuable educational experience, developed spatial perception of anatomy<sup>28</sup>. In a similar manner Reed et al published another survey where fresh frozen cadavers were employed for tutoring surgical procedures, vascular anatomy to 2<sup>nd</sup> and 3<sup>rd</sup> year residents of general surgery<sup>29</sup> in which a dissection manual was created, an informal questionnaire was used.

The assessment consisted of an informal but standardly designed questionnaire that was issued to the participants in order to summarize the overall opinion which was found to be commendable in terms of taking prosection as highly effective academic tool fulfil the expectations of the modern medical curriculum.

A number of negative aspects like the time consuming nature of dissection (40%), and the smell of the embalmed cadavers have also been pointed out on the part of participants (40%). Only a minority of students and teachers in our study perceived anatomical dissection as stressful phenomenon (18%), put lot of struggle in the exploration and identification of structures (38.3%). Our study results in this context are in match with the previous studies that have set for the significant anxiety among a group of students involved in cadaveric dissection<sup>30</sup>. In a similar manner, no assessment of the skills learnt or their transference to the operating room was concluded just like as during hands on experiments conducted as part of various workshops. Many limitations of this model in the trainees'/Students / teachers opinion are found to be the absence of active bleeding, the absence of breathing perception and limited hours of working as the cadavers tended to become malodorous after few hours. One of the negative points of dissection is its one directional nature. The cut structures undergo irreversible

damage, limited availability of cadavers. Surgical techniques should be followed and developed, during their formative pre-clinical years. It is an opportunity to understand the true architecture of the human body, appreciate its complexities and realize the natural variation seen between individuals. There is a need to develop data to know whether doctors who studied at non-dissection universities feel that their anatomical knowledge is sufficient and does not impact on their ability to work as general practitioners and specialists. Therefore, as dissection becomes less common throughout the UK medical schools, it is essential to explore on abilities in the years to come. Studies would be beneficial when identifying areas in which current non-dissection universities anatomical curricula can change. In addition, if graduates felt at a disadvantage during foundation years or early core training, such feedback could generate better visual significance level of dissection. Additionally, retrospective studies are essential to help gather first-hand evidence of the benefits and shortfalls in non-dissection teaching.

Other group of individuals appreciated the originality of this teaching mode. They stated, dissection provided us a better and lasting guideline towards knowledge, application and understanding of anatomy. These results reflect thorough, enduring and contextual learning experience learned via cadaveric pro-sections which are better appreciated in clinical workplaces where the knowledge might be applied to clinical situations. Infact, this systematic view endorses that trainees value the experience of training on cadavers, although there is no strong evidence at this stage that training of cadaveric models transfers to the operating theatre, hence their usage is required to be further explored. The findings of the current study endorsing a substantial role of cadaveric dissection/pro-section in the designing of an anatomy curriculum in undergraduate medical program. Side by side hands on surgical workshops with trainees should also be promoted in newly designed format. It is strongly advised that due consideration must be given to these aspects while planning modern medical curriculum with its

special recognized relevance to the anatomy practical dissection sessions<sup>28</sup>.

## **Conclusion**

The working through pro-sections is a very effective way of learning human gross anatomy. Such a useful programme is worthy of consideration by departments in modern medical curricula. However, the availability of cadavers is very limited, the storage maintenance cost is rather high enough. Similarly the provision of surgical training facilities is costly. Hence, while manipulating the advantages of using cadavers it is important to assess the circumstances, the level of resources etc. It is lastly advocated that the use of dissection as part of anatomy paradigm may develop a golden opportunity for undergraduate medical students to work on additional learning objectives, such as professionalism, manual dexterity, ethics, teamwork, self- and peer-evaluation.

## **Conflict of Interests**

Authors have no conflict of interests and received no grant/funding from any organization.

## **References**

1. Patel S, Mauro D, Fenn J, Sharkey D, Jones C. Is dissection the only way to learn anatomy? Thoughts from students at a non-dissecting based medical school. *Perspect Med Educ* 2015;5. [DOI: 10.1007/s40037-015-0206-8].
2. Meral Savran M, Tranum-Jensen J, Frost Clementsen P, Hastrup Svendsen J, Holst Pedersen J, Seier Poulsen S, Arendrup H, Konge L. Are Medical Students Being Taught Anatomy in a Way That Best Prepares Them to be a Physician? *Clin Anat* 2015;28:568-575.
3. McMenamin PG, Eizenberg N, Buzzard A, Fogg Q, Lazarus M. A Broad Perspective on Anatomy Education: Celebrating Teaching Diversity and Innovations. *Med J Aust* 2016;204:57.
4. Estai M, Bunt S. Best teaching practices in anatomy education: A critical review, *Ann Anat* 2016;208:151-157.
5. Douglas Anderson. "Prosection." In *Dorland's Illustrated Medical Dictionary*. 30th ed. USA: Philadelphia, Pa. Saunders. 2007.
6. Funmilayo Eniola Olopade, Oluwatosin Adekunle Adaramoye, Yinusa Raji, Abiodun Olubayo Fasola,

- and Emiola Oluwa bunmi Olapade-Olaopa. Developing a Competency-Based Medical Education Curriculum for the Core Basic Medical Sciences in an African Medical School. *Adv Med Educ Pract* 2016;7:389-398.
7. Grignon B, Oldrini G, Walter F. Teaching Medical Anatomy: What is The Role of Imaging Today? *Surg Radiol Anat* 2016;38:253-260.
  8. Pujol S, Baldwin M, Nassiri J, Kikinis R, Shaffer K. Using 3D Modelling Techniques to Enhance Teaching of Difficult Anatomical Concepts *Acad Radiol* 2016;23:507-516.
  9. Lochner L, Wieser H, Waldboth S, Mischo-Kelling M. Combining Traditional Anatomy Lectures With E-Learning Activities: How Do Students Perceive Their Learning Experience? *Int J Med Educ* 2016;7:69-74.
  10. Hammer N, Hepp P, Löffler S, et al. Teaching surgical exposures to undergraduate medical students: an integration concept for anatomical and surgical education. *Arch Orthop Trauma Surg* 2015;135:795-803.
  11. Imakuma ES, Ussami EY, Meyer AJ. Laparoscopic Training Model Using Fresh Human Cadavers Without the Establishment of Pneumoperitoneum. *Minim Access Surg* 2016;12:190-3.
  12. Maitreyee M et al. Methods to Learn Human Anatomy: Perceptions of Medical Students in Paraclinical and Clinical Phases Regarding Cadaver Dissection and Other Learning Methods. *Int J Res Med Sci* 2016;4:2536-2541.
  13. Patel S, Mauro D, Fenn J, Sharkey D, Jones C. Is dissection the only way to learn anatomy? Thoughts from students at a non-dissecting based medical school. *Perspectd Educ* 2015;5 [DOI: 10.1007/s40037-015-0206].
  14. 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;48:205-12.
  15. Lochner L, Wieser H, Waldboth S, Mischo-Kelling M. Combining Traditional Anatomy Lectures with E-Learning Activities: How Do Students Perceive Their Learning Experience? *Int J Med Educ* 2016;7:69-74.
  16. Manyama M, Stafford R, Mazyala E, Lukanima A, Magele N, Kidenya BR, Kimmwaga E, Msuya S, Kauki J. Improving Gross Anatomy Learning Using Reciprocal Peer Teaching. *BMC Med Educ* 2016;16:95-107.
  17. Peterson DC, Mlynarczyk GSA. Analysis of Traditional Versus Three-Dimensional Augmented Curriculum on Anatomical Learning Outcome Measures. *Anat Sci Educ* 2016;9:529-536.
  18. Pujol S, Baldwin M, Nassiri J, Kikinis R, Shaffer KI. Using 3D Modelling Techniques to Enhance Teaching of Difficult Anatomical Concepts. *Acad Radiol* 2016;23:507-516.
  19. Huri E, Ezer M, Cha E. The Novel Laparoscopic Training 3D model in Urology with Surgical Anatomic Remarks: Fresh-Frozen Cadaveric Tissue. *Turk J Urol* 2016;42:224-229.
  20. Steinberg BE, Goldenberg NM, Fairn GD, Lee WL. Is Basic Science Disappearing from Medicine? The Decline of Biomedical Research in the Medical Literature. *FASEB J* 2015;30:515-518.
  21. Nakajima A, Usui A, Hosokai Y, et al. The Prevalence of Morphological Changes in the Thoracolumbar Spine on Whole-Spine Computed Tomographic Images. *Insights Imaging* 2014;5:77-83.
  22. Baxter S. Pre-Med and Medical School Curriculum Reform. *The C SUPERG Blog*. 2011. Available from: <http://www.csuperb.org/blog/author/smbaxter/page/12/>. Accessed July 3, 2014.
  23. Ramsey-Stewart G, Burgess AW, Hill DA. Back to the Future: Teaching Anatomy by Whole-Body Dissection. *Med J Aust* 2010;192:668-71.
  24. Ahmed M. S. Hegazy, Liaqat Minhas. Reflection of the Type of Medical Curriculum on Its Anatomy Content: Trial to Improve the Anatomy Learning Outcomes. *International Journal of Clinical and Developmental Anatomy* 2015;1:52-63 [DOI: 10.11648/j.ijcda.20150103.11].
  25. Arnold P. What is Humanism in Healthcare. 2013 GoldFoundation. [www.goldfoundation.org/aboutus/FAQs/](http://www.goldfoundation.org/aboutus/FAQs/) (Revised 2013). Accessed 22 March, 2018.
  26. Rabow MW, Newman M, Remen RN. Teaching in relationship: the impact on faculty of teaching "the Healer's Art" *Teach Learn Med* 2014;26:121-128.
  27. Singh R, Shane Tubbs R, Gupta K, Singh M, Jones DG, Kumar R. Is the decline of human anatomy hazardous to medical education/profession? A review. *Surg Radiol Anat* 2015;37:1257-1265.
  28. Smarakoon LB, Vithoosan S, Kokulan S, Dissanayake MM, Anthony DJ, Dissanayake V et al. Anatomy of Teaching Anatomy: Do Prosected Cross Sections Improve Students Understanding of Spatial and Radiological Anatomy? *Anatomy Research International*. 2016;1-4. Available from: <https://www.hindawi.com/journals/ari/2016/8984704/abs/>. [DOI: <http://dx.doi.org/10.1155/2016/8984704>]
  29. Reed AB, Crafton C, Giglia JS, Hutto JD. Back to basics: use of fresh cadavers in vascular surgery training. *Surgery* 2009;146:757-762.
  30. Williams AD GE, Soricelli RL, Depace DM. Medical students' reactions to anatomic dissection and the phenomenon of cadaver naming. *Anat sci edu* 2014;7:169-80. [DOI: <https://doi.org/10.1002/ase.1391>]