MEDWIN PUBLISHERS
Committed to create value for Researchers

Journal of Human Anatomy

Reshaping Anatomy Education – The Need of the Hour

Dinesh Kumar V*

Department of Anatomy, Pondicherry Institute of Medical Sciences, India

***Corresponding author:** Dinesh Kumar V, Assistant Professor, Department of Anatomy, Pondicherry Institute of Medical Sciences, Puducherry- 605014, India, Tel: 9994038701; E-mail: dinesh.88560@gmail.com

Commentary

Volume 1 Issue 2

Received Date: August 12, 2017

Published Date: August 21, 2017

Curricular reform in the anatomical sciences education is at cross roads. Many medical schools are continuing to modify their curriculum and educational methods with respect to anatomy. On one hand, the hours allotted for teaching anatomy has been significantly reduced, which prevents the anatomy educators from imparting their best to the students and on other hand, it has been dreaded that, because of the drastic reduction in time devoted to gross anatomy, ``the amount of detail in gross regional anatomy has now decreased below the safety level'' [1].

Based on the report given by Carnegie foundation, we can frame three goals for anatomy education which makes the student "prepared for medical profession" [2]. Firstly, the learning outcomes should be standardized, so as to ensure that students must achieve the desired competencies at the end of professional year. Second, the pedagogical framework should be an integration of knowledge and clinical experience. The adherence to minute details of regional anatomy, is viewed as a redundant exercise both by medical students and anatomy educators. Thirdly, the habit of 'thinking / inquiry' should be inculcated in students. To sum up, to combat the problem of reduction of hours earmarked to anatomy teaching, anatomy curriculum should move away from a teacher-centred approach towards a more student-centred approach, increased self-directed learning, reduced unnecessary redundancy in the curriculum, vanishing compartmentalized teaching and testing by effective integration [3].

The 'Millennial generation students' of today differs a lot from the students of previous generation. The change in their traits should be taken into account during curricular revision. Millennials have greater needs to belong to social groups, stronger team instincts and tighter peer bonds, and greater needs to achieve and succeed compared with previous generation students [4]. Applying this core principle, most medical schools of today place emphasize on group activities and team based learning. On other hand, today's assessment method mostly requires regurgitation of engulfed titbits which the students are provided with. It has been stated that, "most students want information reduced to tables or easily handled small information bits" [5]. It has been mentioned that, "wide gap between students' competence in passing formal examinations of their knowledge and their understanding of its real world application" [6]. Remembrance / retention which are the prime requirement to pass an examination focus on the past whereas the curriculum needed should focus on the future [7]. As stated by Anderson et al., [7] "if the goal of instruction is to promote transfer, objectives should include the cognitive processes of understand, apply, analyse, evaluate, and create". In essence, the curriculum teaches and examines 'rote' learning does very little to enhance the chance that individual students will achieve their full potential.

Silver Linings and Path Ahead

The dissociation, because of which the students can't transfer the knowledge provided by the curriculum to solve clinical problems, can be rectified to an extent by teaching in relevance to context. The contexts that are commonly used in anatomy teaching are 1) clinical skills (physical examination) 2) interpreting radiological images (cross sectional anatomy) 3) anatomical diagnosis of diseases 4) surgical procedures [8].

Clinical Skills (Physical Examination)

Students might understand anatomy if they know the 'meaning' of what is learnt. Understanding the relationships of structures and clinical manifestations (contextualization) may make anatomy more meaningful [9]. For example, the clinical signs and symptoms of acute appendicitis if contextualized with regional anatomy of

appendix could make lecture sessions more meaningful. Understanding how surface features can reveal details of underlying structures (topographical anatomy) serves as an introduction to patient examination [10]. It has been said that, anatomy correlation course developed to offer first year students an opportunity to learn basic physical examination methods correlated with anatomical structures was also found to be effective [11]. This can be extended to examination of peripheral pulses, testing of ligaments and tendons related to joints and percussion skills.

Use of *in vivo* imaging, can enhance the understanding of the surface anatomy and its relationship to underlying tissues [12]. This can be taught to the students using ultrasonography, which enables visualizing the organs and their dynamic features of physical examination [12]. Ultrasound can thus be an effective teaching methodology to revisit basic concepts especially in abdomen and musculoskeletal system. The disadvantage is it needs certain level of technical expertise to make students perceive the nuances (knobology) associated with the modality.

Interpreting Radiological Images (Sectional Anatomy)

The rapid development of technologies and techniques for minimally invasive surgery has transformed the knowledge of anatomy required for clinical practice [13]. The 'eye of medicine' is a resource with the potential to fill such gaps between basic sciences and clinical medicine. It can provide the future doctors with a succinct and true-to-life view of the normal as well as the disease processes in a non-invasive manner [14,15]. The inclusion of sectional anatomy training in medical school curricula has been found to have a great impact on subsequent CT interpretations [16]. In a study [17], where system based approach of incorporating radiology to review anatomy in different imaging modalities was administered, 95% of students felt that including radiological images helped link anatomical knowledge to the clinical picture Thus, inclusion of sectional anatomy can provide a different perception of the structures which the students had perceived using their "tactile" sensation in routine cadaveric dissection. Branstetter, et al. [18] found that following radiology teaching, medical graduates were more likely to request appropriate radiological investigations and interpret them correctly. Thus incorporating radiology teaching in anatomy curriculum not only helps the "future physicians" to interpret radiological images, but also serves as a tool to make them understand about the spatial relationships and three dimensional orientations of viscera.

Case Based Learning

Drake [19] describes a clinically orientated approach to introduce concepts and facts of anatomy called 'case-directed anatomy'. Case-based learning can be positioned between structured and guided learning [20]. This may aid the students to: 1) analyse acquired anatomical knowledge more in depth 2) working with peers to come with solutions to the given realistic scenarios (collaborative learning) 3) recognize the need to critically evaluate the information provided 4) promote experiential learning and specific skills such as ability to brainstorm, connect, and recall information [21]. The teacher has to play a different role as he /she is not considered as a repository of knowledge. By throwing open ended questions, making the critical thinking process visible and promulgating students in active group process, the teacher should be able to provide anchored instructions. This demands a lot from the facilitators of case based learning sessions as they need to be aware of the subtle transitory signs (positive and negative) then and there, and synchronise active learning process. Hmelo-Silver [22], an expert in facilitating PBL sessions, found that he had accomplished his role largely through metacognitive questioning and elicited causal explanations (via hypothetical-deductive reasoning).

Case based learning is thus an effective paradigm to 1) learn anatomy content within a clinical context 2) develop critical thinking skills, and (3) expose to clinical scenarios in first year of medical training. In an interesting quasi-experimental study [23], where students adhering to traditional teaching format and PBL format were longitudinally followed, it was found that students in the PBL curriculum were more likely to produce accurate hypotheses and coherent explanations than students in the traditional curriculum. This is because they can apply concepts rather than facts. Their basic science knowledge was flexible in that they were able to transfer it to new problem situations [23]. It can be concluded that, PBL if effectively implemented encourage deep approach to learning. Instead of learning in discrete parts, a student gets an integral knowledge of a particular structure, illuminated from different angles and also gets exposed to underlying anatomical basis of a disease at hand.

Copyright© Dinesh Kumar V.

Surgical Procedures (Surgical / Laparoscopic Anatomy)

It has been said that excessive amount of redundant material taught without relevance in the first year of medical education is unsound as it encourages superficial learning [24]. Largely content driven gross anatomy course, over-stuffed with facts, results in students being overwhelmed with learning complex details with very little understanding of its relevance [25]. The rationale behind the call for pre-integrating anatomy and surgery is to expose the students the way clinicians think. The 'traditionalists' who strongly adhere to discipline based curriculum and favour cadaveric dissection as the ultimate teaching modality and the 'modernists' who are mostly medical educationalists often debate in this issue, as to "how much" and "when" this integration should be done [26].

With the advent of modern surgical techniques, non-invasive diagnostic procedures and interventional devices, the anatomical knowledge (often minute) required by students to become efficient clinicians has changed [27,28]. For example, the knowledge and viewpoint offered by traditional dissection on para-nasal sinuses and lateral wall nose is different from that offered by nasal endoscopy; the same holds for abdominal anatomy and laparoscopic view. In this respect, the concepts of basic anatomy are not modified, but horizons for the interpretation of anatomic structures are significantly expanded [29]. Dozois EJ [30] had mentioned that "demonstration of laparoscopic procedures is a great way to reinforce the importance of learning anatomy and it will excite medical students about how to apply their knowledge of anatomy". In a study by Fitzpatrick, et al. [31] it has been reported that 78% of students felt a laparoscopy demonstration enhanced learning and Glasgow, et al. [2] found that more than 95% of responding students agreed that cadaver-based laparoscopy demonstrations enhanced their understanding of abdominal anatomy.

Surgical / laparoscopic anatomy requires far different conceptualization compared to traditional gross anatomy course because the surgeon must learn to rely more on visual cues to perform an appropriate anatomical dissection [33]. This would be of immense help to identify proper tissue planes and avoid excess traction. When a student observes these operative procedures being performed at this much slower pace, under video directed magnification, has a much greater opportunity to fully conceptualize surgical anatomy [33]. In essence, anatomy educators should consider including surgical / laparoscopic anatomy videos in existing curriculum which would be a form of vertical integration.

Conclusion

The place of anatomy education in medical curriculum remains a topic of considerable controversy in terms of content and relevance. Absence of rigorous and pedagogic research regarding the different methods [34] and ideological dichotomy between "traditionalists" and "modernists" add fuel to the fire. Nevertheless, multimodal integration of teaching methodologies (Hybrid teaching model) possibly improves the clinical anatomy knowledge in a progressive way. Teaching methodologies should be tested to examine whether the methods applied promote retention of material and the ability to link knowledge to the clinical setting, any assessment of the course would need to continue up through clinical training [35]. In the era of evidence based medicine, institutions should test whether these innovative methods suit their educational philosophy and micro-analyse the learning environment, so that it can be ensured that students are able to meet the growing demands in future.

References

1. Sinclair D (1975) The two anatomies. Lancet 1(7912): 875-878.

2. Cooke M, Irby DM, O'Brien BC (2010) Educating Physicians: A Call for Reform of Medical School and Residency; San Francisco: Jossey-Bass.

3. Drake RL (2014) A retrospective and prospective look at medical education in the United States: trends shaping anatomical sciences education. J Anat 224(3): 256-260.

4. Lancaster LC, Stillman D (2003) When Generations Collide: Who They Are, Why They Clash, How to Solve the Generational Puzzle at Work. New York, NY: Harper Business.

5. Newton BW, Menna JH, Tank PW (2009) How to Become an Effective Course Director. 1st (Edn.) New York, NY: Springer, pp: 97.

6. Biggs JB (1989) Approaches to the enhancement of university teaching. High Educ Res Dev 8(1): 7-25.

Copyright© Dinesh Kumar V.

7. Anderson LW, Krathwohl DR, Airasian PW, Cruikshank KA, Mayer RE, et al. (2001) A Taxonomy for Learning, Teaching and Assessing: A Revision of Bloom's Taxonomy of Educational Objectives; 2nd (Edn.), New York, NY: Longman Pp: 336.

8. Bergman EM, Van der Vleuten CPM, Scherpbier AJ (2011) Why don't they know enough about anatomy? A narrative review. Med Teach 33(5): 403-409.

9. Wilhelmsson N, Dahlgren LO, Hult H, Scheja M, Lonka K, et al. (2010) The anatomy of learning anatomy. Adv Health Sci Educ Theory Pract 15(2): 153-165.

10. Aggarwal R, Brough H, Ellis H (2006) Medical student participation in surface anatomy classes. Clin Anat 19(7): 627-631.

11. Dusseau J, Knutson D, Way D (2008) Anatomy correlations: Introducing clinical skills to improve performance in anatomy. Fam Med 40(9): 633-637.

12. Sweetman GM, Crawford G, Hird K, Fear MW (2013) The Benefits and Limitations of Using Ultrasonography to supplement Anatomical Understanding. Anat Sci Educ 6(3): 141-148.

13. Regan de Bere S, Mattick K (2010) From anatomical 'competence' to complex capability. The views and experiences of UK tutors on how we should teach anatomy to medical students. Adv Health Sci Educ Theory Pract 15(4): 573-585.

14. Ganske I, Su T, Loukas M, Shaffer K (2006) Teaching methods in anatomy courses in North American medical schools the role of radiology. Acad Radiol 13(8): 1038-1046.

15. Gunderman RB, Siddiqui AR, Heitkamp DE, Kipfer HD (2003) The vital role of radiology in the medical school curriculum. AJR Am J Roentgenol 180(5): 1239-1242.

16. de barros N, Rodrigues CJ , Rodrigues AJ (2001) The Value of Teaching Sectional Anatomy to Improve CT Scan Interpretation. Clinical Anatomy 14(1): 36-41.

17. Schober A, Pieper CC, Schmidt R, Wittkowski W (2014) "Anatomy and imaging": 10 years of experience with an interdisciplinary teaching project in preclinical medical education-from an elective to a curricular course. RoFo 186(5): 458-465.

18. Branstetter BF, Faix LE, Humphrey AL, Schumann JB (2017) Preclinical medical student training in radiology: the effect of early exposure. Am J Roentgenol 188(1): W9-W14.

19. Drake RL (2007) A unique, innovative and clinically oriented approach to anatomy education. Acad Med 82(5): 475-478.

20. Thistlethwaite JE, Davies D, Ekeocha S, Kidd JM, MacDougall C, et al. (2012) The effectiveness of case based learning in health professional education. A BEME systematic review: BEME Guide No. 23. Med Teach 34(6): e421-e444.

21. Hanshaw LG (2012) Qualitative aspect of group-only testing. Coll Stud J 46(2): 419-426.

22. Hmelo-Silver CE, Barrows HS (2002) Goals and strategies of a constructivist teacher. Paper presented at American Educational Research Association Annual Meeting; New Orleans, LA.

23. Hmelo CE (1998) Problem-based learning: Effects on the early acquisition of cognitive skill in medicine. J Learn Sci 7(2): 173-208.

24. Ramsden P (2003) Learning to Teach in Higher Education 2nd (Edn.), London: Routledge Falmer; Learning from the student's perspective. Chapter 5.

25. Patel KM, Moxham BJ (2006) Attitudes of professional anatomists to curricular change. Clin Anat 19(2): 132-141.

26. Turney BW (2007) Anatomy in a modern medical curriculum. Ann R Coll Surg Engl 89(2): 104-107.

27. Shaffer K (2004) Teaching anatomy in the digital world. N Engl J Med 351(13): 1279-1282.

28. Kumar PA, Norrish M, Heming T (2011) Laparoscopic surgery recording as an adjunct to conventional modalities of teaching gross anatomy. Sultan Qaboos Univ Med J 11(4): 497-502.

29. Gogalniceanu P, Madani H, Paraskeva PA, Darzi A (2008) A minimally invasive approach to undergraduate anatomy teaching. Anat Sci Educ 1(1): 46-47.

30. Dozois E (2008) Laparoscopic anatomy for medical students. Anat Sci Educ 1(3): 135.

Copyright© Dinesh Kumar V.

31. Fitzpatrick CM, Kolesari GL, Brasel KJ (2001) Teaching anatomy with surgeons'tools: Use of the laparoscope in clinical anatomy. Clin Anat 14(5): 349-353.

32. Glasgow SC, Tiemann D, Frisella MM, Conroy G, Klingensmith M (2006) Laparoscopy as an educational and recruiting tool. Am J Surg 191(4): 542- 544.

33. Magtibay PM (2008) Traditional Cadaveric Anatomy . . . Gross! Endoscopic Anatomy Is Where It Is At. Anat Sci Ed 1(2): 92-93.

34. Pais D, Moxham BJ (2013) Should Gross Anatomy be taught systemically or regionally? Eur J Anat 17(1): 43-47.

35. Rizzolo LJ, Rando WC, O'Brien MK, Haims AH, Abrahams JJ, et al. (2010) Design, implementation, and evaluation of an innovative anatomy course. Anat Sci Educ 3(3): 109-120.

Copyright© Dinesh Kumar V.