

"Between a Rock and a Hard Place"

The discordant views among medical teachers about anatomy content in the undergraduate medical curriculum

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"بين المطرقة والسندان"

تفاوت وجهات النظر بين أساتذة الطب عن محتويات مناهج مادة التشريح البشري خلال الدراسة الجامعية

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الملخص: تميّز التعليم الطبي خلال العقدين الماضيين بدفع مضطرد نحو الإصلاح. وبالطبع كانت مادة التشريح البشري كذلك في خضمّ هذا التغيير والتطوير، كونها ولمئات السنين علم أساسي في المناهج الطبية، في خضمّ هذا التغيير والتطوير. فمن المتفق عليه أن الأطباء الجيدين على معرفة كافية بعلم التشريح، ولكن هناك من يقل اتفاقاً على مدى الكَم لهذه المعرفة ومن هو الطرف الذي يحدد هذا الكَم. فالعديد من الأطباء الممارسين يعتقدون بأنّ طلبة الطب ليسوا على مستوى كافٍ من المعرفة لهذا العلم الأساسي قبل انتقالهم إلى المراحل السريرية لتدريبهم. وتشجّع مجالس الاعتماد المهني على الحد من كَمّية المعلومات التي تُدرّس في مساقات التعليم الجامعي الأدنى. ويشكو مدرسو مادة التشريح من استمرار تقليص الوقت المخصص لتدريس هذه المادة الأساسية. وبالنتيجة يقع في خضمّ هذا الجدَل طالب علم التشريح بالحيرة والارتباك حول ما هو مطلوب منه ليُصبح مهنيّاً آمناً. والطريق إلى الأمام هو، أولاً، أن تقوم كليات الطب بتسهيل الجو المناسب لحوار بين الطلبة وأساتذة علم التشريح والأطباء الممارسين لتحقيق هذه الرؤى المتباينة ووضعها على طريق متناسق وامتزن. وثانياً، إنّ أساتذة علم التشريح يحتاجون إلى إعادة النظر بأنفسهم في أمرين اثنين من الهيكلية الرئيسية، الأول: إلى تدريس هذا العلم في السياق الذي سيتم استخدامه عملياً من قبل الطالب، والثاني: توظيف تقنيات تعليمية حديثة معاصرة في تدريسهم وتقييمهم لهذه المادة.

مفتاح الكلمات: التشريح، المنهاج، الجامعي، التعليم الطبي.

ABSTRACT: The last two decades of medical education have been marked by a persistent push towards curricular reform. Anatomy as a discipline, the unshakable foundation of medical teaching for hundreds of years, has been at the centre of this development. Although it is widely agreed that for doctors to be competent, they need an adequate knowledge of anatomy underpinning medicine, there is much less agreement over the quantity required, and who should decide and define it. Many clinicians feel medical students are being under-trained in this basic medical science before reaching the clinical stages. Professional accreditation boards advocate the reduction of factual information in undergraduate medical courses. Anatomists complain of a progressive erosion of the time allocated to the subject. Caught in the midst of this controversy is the student of anatomy who is left bewildered and confused about what is required from him to become a safe and competent health professional. The way forward might, first, be for medical schools to facilitate discussions between students, anatomy professors, and clinicians to bring these divergent perspectives into alignment. Second, the anatomists need to re-invent themselves in two principal frameworks: first, to present the subject in the context within which it will be utilised by the student, and second to employ the overwhelming learning tool of today, i.e. technology, in their teaching and assessment of the subject.

Keywords: Anatomy; Curriculum; Undergraduate; Medical education.

THE LAST TWO DECADES OF MEDICAL education have been marked by a push towards curricular reform, and anatomy as a discipline, the unshakable foundation of medical teaching for hundreds of years, has been at the

centre of this development. Disagreements and controversies surround teaching styles, content, and the time dedicated to the discipline within the greater medical school curriculum.¹ With traditional teaching marginalised, many anatomists

and clinicians judge anatomy to be in a state of crisis.^{2,3} Others, especially those anatomists with awareness of technology and education principles who have adopted a more "modernist" approach, are embracing new teaching methods and the use of technology.⁴ Proponents of traditional teaching insist that the dissection of human cadavers be the mainstay of rigorous basic medical science training as it underpins subsequent clinical learning.^{5,6} Those who support newer teaching modalities (e.g. computer-assisted learning) argue not only about the difficulty in obtaining human material in some settings, but also about the ethical, moral, and legal aspects related to the use of human materials in teaching.^{7,8} On one side of the controversy, are the clinicians who remain increasingly worried that medical students are under-trained in basic medical sciences before reaching the clinical years.⁹ For example, in 2003, McKeown, *et al.* found that students in their school's new systems-based curriculum scored poorly in anatomy assessments compared to students from previous years.¹⁰ Data collected by Waterston and Stewart, published in 2005, led them to conclude that "the majority of clinicians feel that the current anatomical education of medical students is inadequate, and below the minimum necessary for safe medical practice."¹¹

On the other side of this controversy are the educationalists in medical schools and professional accreditation boards who are saying very loudly, 'more reasoning and less memorising is better'. For example, in the United Kingdom, the move to re-examine how much anatomy (and, indeed, how much of all basic medical sciences) is taught was partly motivated by the UK General Medical Council's (GMC) report 'Tomorrow's Doctors'.¹² This report stated that undergraduate training is only the first step in a continuum of medical education and recommended that factual information in undergraduate medical courses be kept to the essential minimum. Similarly, in the USA, the General Professional Education of the Physician (GPEP) report,¹³ and subsequent publications, recommended a reduction in lecture hours, increased problem solving, more conceptualisation, and decreased passive memorisation in medical programmes.¹⁴

A third angle in this controversy comes from professional academic anatomists who are increasingly concerned about how to stake out and

defend territory within the medical curriculum. They complain of progressive erosion of the time allocated to teaching the subject within the undergraduate programme.

Caught in the midst of this three-way controversy, in other words, "between a rock and a hard place", are the medical students who are understandably concerned as to whether the clinicians' fears are justified, or whether detailed anatomy content is in fact simply not necessary at their stage in the continuum of medical education. The aim of this article is therefore to encourage discussion between various interest groups in our medical school setting, and others similar to ours, regarding this pivotal discipline. In an attempt to tackle the various related areas of this controversy, the basic question that needs to be addressed might be: How much anatomy is enough for the undergraduate medical programme?

How much anatomy is enough?

"So, they only give you 6 weeks of anatomy, then send you out onto our surgical service chock-full of ignorance, huh? There are some basic things I need you to come in knowing, and you can't possibly have learned them in 6 weeks of 'Anatomy lite'.¹⁴

The rapid rise of integrated curricula and approaches that are a departure from traditional didactic methods have given rise to concern about the level of knowledge attained by students graduating from innovative programmes, for basic medical sciences in general, and for anatomy in particular. However, the concerns of teachers and clinicians are mostly anecdotal and expressed informally. Anatomists (and surgeons involved in the higher surgical examinations) have commented on the decline of students' knowledge and their lack of understanding of anatomy in discussions, anatomical meetings, and other fora.¹⁵ Waterston and Stewart, for instance, surveyed the opinions of clinicians on this subject. Their results indicated that the majority believed that anatomy is not adequately taught, and as a result, students' knowledge is below the minimum necessary for safe medical practice.¹¹

"We can't remember all of it by the time we start clinicals.... The teaching was too intense... we ended up cramming rather than learning aspects useful for clinicals" (intern).¹⁶ As illustrated by this comment,

the counter argument is that there is 'too much anatomy in the undergraduate curriculum' and that 'not every medical student will become a surgeon' and so it unnecessary for him or her to have such a detailed knowledge of human structure. In a survey of graduating students about to commence internship, Fitzgerald *et al.* reported a common perception that the amount of anatomy in the curriculum was too great to allow for meaningful reflection of its application.¹⁶

What these conflicting tendencies reveal is the lack of agreement on how much anatomical knowledge is enough for the undergraduate phase of medical education. This makes it imperative that very careful consideration be given to two issues: the quantity of anatomy knowledge medical students need to gain, and the stage of the curriculum at which such knowledge should be acquired. The basic principle that should guide this discourse ought to be a definition of the minimum working knowledge of human anatomy that allows an independent practitioner to practice safely and communicate effectively with patients and other medical professionals. This however, raises two equally vital questions: first, Who decides how much anatomy to teach? and second, How to evaluate this learning?

Who decides how much anatomy to teach?

Who should decide how much anatomy to teach? Should this decision be left to the discipline experts, the specialist clinicians, or the general practitioner? The two main approaches commonly reported in the literature, are the top-down approach, where groups of experts determine the educational objectives and disseminate them to teachers, and the bottom-up approach, where teachers, students and other stakeholders determine the learning outcomes.¹⁷

Whilst specialist clinicians and professional anatomists have excellent knowledge of the discipline and can ensure that relevant areas of practice do not go unnoticed,¹⁸ they tend to propose learning outcomes that are too ambitious¹⁹ and the net effect can be a factually overloaded anatomy curriculum. Conversely, asking a group of experts representing different disciplines within the undergraduate curriculum to reach consensus

may help to generate more realistic learning objectives.¹⁹ This type of bottom-up approach is more efficacious because the process recognises that successful curriculum implementation relies on its acceptance by teachers and students.²⁰ Indeed, a wider collaborative processes involving a number of stakeholders, such as senior clinicians, students, foundation doctors, local decision makers, educational experts, who determine what is to be learnt, have been reported to promote ownership of the content.^{21,22} This is because all stakeholders are likely to sign-up to the content and get involved in its delivery because they were consulted during its formulation.

How should anatomy be learnt and evaluated?

A solid foundation in anatomy is still perceived by many students and anatomists to be the best preparation for safe basic clinical procedures.²³ In recent years, anatomy curricula in many institutions have undergone change concomitant with a significant reduction in the time allocated to anatomy teaching.^{24,25} Few institutions, even within a single country, have the same curriculum.^{26,27} Anatomists have been forced to curtail their curricula because of the introduction of additional subjects and different teaching modes to the medical course and, in some cases, the belief that the subject should be content-driven and not skills-based.²⁸ In many medical schools, most teaching is still done through dissection sessions, which could last for months whilst others rely only on prosections, medical imaging and learning on living subjects (actors) and videos. There are strongly held opinions even amongst anatomists for and against dissection as the primary method of teaching and learning in anatomy.²⁹⁻³² This dichotomy is most unhelpful to the teaching of the subject because, in some settings, there are, for various reasons, no available cadavers³³ and hence learning by dissection is not an option. The underlying consideration of how the subject should be taught ought to focus on the clinical scenario that anatomy is seen most often by the general practitioner. This is mostly in the form of surface anatomy of the human body, radiological images, endoscopic procedures,³⁴ and when performing basic clinical procedures such as intravascular administration of drugs. In

this manner, the teaching method could then be organised to provide maximum opportunities for learning using those clinical scenarios.

It is believed assessment is a major determining factor that drives student learning.³⁵ Therefore, closely linked to the process of deciding what parts of anatomy to learn, is the issue of evaluation of such learning. Inappropriate assessment is not only detrimental to learning, but also has the potential to result in learning that is not transferred to the workplace.³⁶ Medical students generally look to assessments (examinations) for guidance on what material is worth studying. For example, creating examination items that require students merely to recall isolated facts without testing them on the application of those facts is likely to result in pure memorisation of structures without an understanding of the relationships between the components. Clearly, in order to encourage learning for understanding, assessments need to test more than a recall of isolated facts. Instead, assessments should focus on the application of basic medical science knowledge, often to clinical situations, and on integration of knowledge across topics and courses to achieve a coordinated, cross-disciplinary understanding of those situations.³⁷

Implications for the undergraduate curriculum

Over the last 25 years, the entire anatomy curriculum at our medical school has seen two major phases. The first was the development of the medical programme itself. This still extends over seven academic years:³⁸ the first four years are pre-clinical and lead to the award of the B.Sc. Health Sciences degree; the remaining three years are a clinical programme leading to the MD (doctor of medicine) degree. In phase one, anatomy teaching took place mainly during the B.Sc. Health Sciences programme. The bulk of the subject was presented by integrating not only the components of the subject among themselves, but also by integrating them with the other basic medical sciences in body-system courses.³⁹ The content was taught by basic medical scientists who had little or no interaction with their clinical colleagues, either when determining the content, or in the process of teaching it to medical students.

The second phase was the major revision of the entire medical curriculum between 2002 and 2007 which culminated in the introduction of the new undergraduate medical curriculum in 2008. This revision was partially in response to a period when some subjects were claiming a greater share of curriculum time, especially those whose research has advanced most rapidly, particularly molecular biology and biochemistry. Therefore, the emphasis during the revision process was on reducing 'content overload' to ensure that only 'core' material was presented, and on establishing not only horizontal integration with other basic medical sciences, but also some vertical integration with clinicians taking part in teaching during the early years of the curriculum.

The way forward

Arguably, the discipline of anatomy has a very central role in the process of training doctors and supporting modern medical practice. The current controversy therefore, has a number of implications for the discipline and its position within the medical curriculum of the future.

Historically, most anatomy content has been taught predominantly in the first undergraduate year with very limited exposure to the subject in subsequent clinical training. This is educationally faulty, as, at the preclinical stage, the material is likely to appear irrelevant thereby encouraging superficial learning. A solution would be to integrate anatomy vertically into medical education so that students are exposed to anatomy teaching throughout undergraduate professional training.⁴⁰ Revisiting the subject throughout the continuum of undergraduate studies, most especially during clinical training so as to emphasise relevance, would appear to be the rational step to take. Indeed, in 2005, Waterston and Stewart reported widespread support among clinicians for more vertical integration of anatomy teaching throughout the undergraduate curriculum.¹¹

It is unrealistic to expect detailed proficiency in anatomical knowledge at the undergraduate level of medical education. There is a need for wide consultation with a broad stakeholder group to identify core anatomical content that is indispensable for safe medical practice at the point of graduation. Regardless of whether a top-down

or bottom-up approach is adopted to identify this core content, medical schools should facilitate discussions between students, basic medical science professors, and clinicians in order to bring their various perspectives into alignment.⁴¹

Once this core content is identified, any other extra content may be regarded as elective and could be studied by students requiring an in-depth exploration for their chosen specialty. In the process of identifying this 'core anatomy', the clinicians, the majority of whom were trained under the traditional lecture-based, dissection-based anatomy curricula, need to realise that the aim of the undergraduate curriculum is not to produce specialists. As such they should resist the temptation to insist that undergraduate students have detailed anatomy knowledge related to their specialty. It could as well be argued that dogmatic support amongst some professional anatomists for detailed anatomy courses at the undergraduate level may have been detrimental to the evolution of anatomy as a subject. Probably, the discipline of anatomy needs to reinvent itself as a subject. It should evolve to address the requirements of the subject in a medical curriculum in the 21st century.⁴⁰ In the interest of promoting knowledge retention, contextual learning and clinical application of the discipline, anatomy professors need to become more innovative. This innovation should include the adoption of sound pedagogy as well as the use of technology in teaching and assessing the subject.^{33,42} An example of how anatomists need to innovate, especially in the Middle East, relates to the lack of human material (cadavers) for teaching. This challenge ought to be turned into an advantage by the enhanced usage of radiological, surface and living anatomy.

Conclusion

Although it is widely agreed that for doctors to be competent, they need an adequate knowledge of anatomy underpinning medicine, there is much less agreement over the quantity required, and who should decide and define it. Many clinicians feel medical students are being under-trained in this basic medical science before reaching the clinical stages; professional accreditation boards advocate the reduction of factual information in undergraduate medical courses such as anatomy.

Anatomists complain of a progressive erosion of the time allocated to the subject within the medical curriculum. In the interest of transparency, the way forward might be, first, for medical schools to facilitate discussions between students, anatomy professors, and clinicians to bring these divergent perspectives into alignment. Second, the anatomists need to re-invent themselves. Foremost in their mind should be the question as to how doctors encounter anatomy in clinical practice. Emphasis on these issues should dominate the debate regarding anatomy teaching for medical students. Finally, it goes without saying, that if student learning of anatomy is to change then assessment methods must also change. A future article on this issue would address the question of the nature and content of this new anatomy for undergraduate education, particularly in developing countries such as ours. It will also offer some practical suggestions on the way this knowledge should be assessed.

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