

Anatomy into the future

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Anatómia budúcnosti

Abstract

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The necessary increase in the clinical components of the medical curriculum has created pressure to reduce the amount of time spent on basic science, particularly the detailed learning of anatomy. Methods of learning must be re-evaluated, but departments will be constrained by resources available. The clinical aspects of anatomy should form the principles of a core course, with a limit to the wider anatomical knowledge required. Feedback from the students is recommended as an initial form of monitoring the course. (Ref. 13.)

Key words: anatomy, learning, teaching, students, curriculum, core course, feedback.

During the last 50 years there have been great advances in medical knowledge such as the introduction of new drugs for many conditions and new methods of investigation, all of which have contributed to the enormous amount of factual information that medical students are required to learn. To know all is impossible. There is a need, therefore, to review the medical curriculum to define the necessary in order to reduce the learning load and to limit the unnecessary. Anatomy is the one subject that traditionally has been taught in great detail mainly to pass an examination. Those students with the advantage of a retentive memory do well in such examinations, but students with an enquiring mind and who enjoy solving problems in a logical way do not flourish (McNair, 1926). It is essential to encourage problem solving early in the student's medical career to establish deep learning necessary for their future and to diminish the burden of rote learning of detail, superficial learning, the vast majority of which is forgotten after the examination. It would seem sensible to review the learning of anatomy and to introduce the reason for

Abstrakt

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Potreba nárastu klinických komponentov v medickej učebných osnovách vytvorila tlak na redukciu množstva času venovaného na základné vedy, konkrétne na podrobnú znalosť anatómie. Metódy učebného procesu sa musia prehodnotiť, no katedry budú obmedzované dostupnými zdrojmi. Klinické aspekty anatómie by mali tvoriť princípy základného kurzu s limitovaním požiadaviek na širšiu znalosť anatómie. Odporúča sa, aby úvodnou formou monitorovania kurzu bola spätná väzba od študentov. (*Lit. 13.*)

Kľúčové slová: anatómia, výučba, učenie sa, študenti, učebné osnovy, základný kurz, spätná väzba.

knowing about the important anatomical structures. That reason must be the clinical application and often the clinicians are best able to provide this, as professional anatomists usually do not have clinical experience. Many clinicians, not necessarily surgeons (Ellis, 1994), have an interest in teaching anatomy and on their retirement could provide the clinical input for their anatomical colleagues.

The traditional detailed dissection of the cadaver may not be the best way to accomplish such a course, although to remove dissection entirely would eliminate the unique opportunity of discovery and exploration of the human body to also find the all too common anatomical variant. The way forwards must be a combination of learning methods. It is mandatory for students to appreciate that from their first days at University they are to learn, whereas at school they were taught. The role of professors, lecturers, and demonstrators is to guide their learning. "The art of teaching is the art of assisting discovery" — Mark van Doran.

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Learning methods

The following are recognised ways in which students are expected to learn. Some are traditional, others are modern and no doubt with time other methods will be introduced: lectures, textbooks, demonstrations, dissecting the cadaver, video recordings, computer aided learning, preserved specimens in pots, plastinated specimens, use of all or some of the above.

Lectures

Lectures vary in their value and not all lecturers are endowed with the appropriate ability to plan and deliver the required information or to hold the attention of their student audience who may better obtain the facts from textbooks. Lectures should be used for disseminating original work or research and to elucidate difficult areas of study such as the cranial parasympathetic nervous system, the eye, the ear, the larynx, swallowing, posture and walking. It may help students to have some notes of the lecture available at the time or prior to its being given. Ideally the notes of the whole course of lectures would be available as a booklet at the beginning of term. How much should be regarded as "notes" will depend upon the lecturer, but excessively expanded notes may obviate the necessity of the lecture and perhaps the lecturer. An outline of objectives and key statements provide the required signposts and decrease the need for scribbling hurried notes.

Textbooks

There are a large number of anatomical textbooks available for students. The range extends from the most detailed information as found in Gray's Anatomy to an illustrated dictionary and an easy method of learning, "Instant Anatomy" (Whitaker and Borley, 1994). Many textbooks include sections on the clinical application of anatomy and perhaps these would best complement a clinically orientated course. Students will vary in their ability to cope with this range of textbooks and each will find the most suitable for their study. Many of these books are expensive and a range should be available in the libraries, easily accessible for students to elucidate difficulties or to expand on an interest. Departments may wish to produce their own manual incorporating dissecting instruction, text, clinical application and the gist of the course of lectures as has been done in the department of anatomy in Cambridge. Students can then expand this with their own notes, all of which encourages their deep learning.

Demonstrations

The value of demonstrations will vary according to the accomplishment of the staff and the number of students. All students must have an uninterrupted view of the subject as those unable to see will rapidly lose attention. The demonstrator must have the ability to keep the attention of all students but this is extremely difficult with large numbers. The maximum number of students should be no more than ten in a group (Leong Seng-Kee, 1999), an ideal which may be difficult to attain with financial pressures and difficulty in obtaining suitable stain. It is important that every effort be made to encourage student interaction and problem based learning rather than establishing another lec-

ture and passive learning. With larger numbers of students at one demonstration it should be possible to divide them into smaller groups to study separate items such as prosections, the skeleton, models, and surface anatomy. The length of time of the demonstration should be restricted to one and a half hours or less to maintain attention throughout, not only for the students but also for the demonstrators. The quality of the demonstrator's output deteriorates with time. Subjects which lend themselves to demonstration are:

- difficult dissections such as limb joints, the hand and fingers, the sole of foot, the joints of the foot, head and neck, pelvis and perineum,
- special subjects such as the eye, the ear, the larynx, the blood supply to the gastro-intestinal tract,
- cross-sections of the torso, limbs, and head and neck are of value because future doctors will be using computer tomograms and magnetic resonance images,
- models have limited value as there is inability to appreciate the nature of human tissue but they,
- can have value in learning clinical techniques and relationships,
- prosections are only useful if they are of high quality. The prosector must be good, there must be adequate storage and cataloguing, and there is the need for regular replacement due to deterioration with use. Course objectives dictate the creation of specific prosections and a considerable number of prosections are required, some 270 for 150 students (Leong Seng-Kee, 1999),
- radiographs, computer tomography and magnetic resonance imaging are common investigation, and should be correlated with the cadaver,
- surface anatomy is clinically important.

Dissection

The entry of the student into the dissecting room is usually the first encounter with a dead person. This alone can be an extremely emotional episode in their life but is the prologue to many similar encounters in the future. It is an opportunity for the appreciation of and respect for the cadaver, and an understanding that a person's body is presented for their study of anatomy by dissection, a considerable privilege. This respect provides the basis for future encounters with patients, their possible death and with their relatives. Dissection is a unique experience providing a three dimensional picture of the anatomy of the living patient (Yeager, 1996). It enables the student, probably for the only time in their career, to discover for themselves, replacing passive learning with self directed learning and enthusiasm (Leong Seng-Kee, 1999). Each cadaver is different, often each side is different, and may not follow the textbook. Leonardo da Vinci based his studies on his findings on dissection and stated: "If you find from your own experience that something is a fact and it contradicts what some authority has written down, then you must abandon the authority and base your reasoning on your own findings" (Tarshis, 1969). Not only does dissection provide an opportunity to develop manual dexterity, of value in their future, but it also provides the opportunity for students to discover structures in the body by following the course of vessels and nerves, by establishing the attachments

of muscles and tendons and by appreciating the organs. To see is to learn, to seek and find is the experience of life. Students should make the most of it, encouraged by their teachers. Some will, some will not, some can not.

Video-Recordings

The video-camera can be used live to transmit information to large groups. Video-recordings may be purchased or made specifically by the anatomy department in house to illustrate particular subjects. Their limitation is that there is no student participation and they provide passive learning. It is difficult to hold attention for more than a few minutes and they could be of less value than lectures. With an experienced demonstrator video-recordings could be made to aid revision. Another use is the demonstration of clinical examinations such as for the cranial nerves and the nervous system, the chest, the abdomen, and joints. Students then could practice the examination on each other.

Computer aided learning

The full potential of the value of CD-ROM's has not yet been fully established for student learning. They have some of the advantages and disadvantages of video-recordings. Using the correct material CD-ROM's can provide active learning for students who have their own computer, studying in their own time. It is important that the information is accurate, is suitably presented and the image quality is of high standard. Similarly with video-recordings, in-house production may be the most suitable for a particular course, but it is time consuming and requires turnover maintenance as well as large capital outlay.

Preserved specimens in pots

A museum of preserved specimens can provide a useful source of learning material for student study, particularly if there is a problem with a specific part. There are obvious limitations of size but isolated organs, larynx, nasal, pharyngeal and oral cavities and joints may be suitable for this technique. It is essential that the pot can be easily moved about and viewed from all sides. The specimen must be of the highest standard of dissection and presentation, demonstrating the important points to be learned but even then distortion may be produced by refraction.

Plastinated specimens

The recent development of plastinating specimens has many attractions, but may actually have little added value in the learning of anatomy by medical students. They have the essential need to be able to search and to establish the course of structures, which they can do with prosections and by dissection. Plastination would seem a good method of preserving the unique, compared with placing the specimen inside a pot when the colour is lost. The method is laborious, expensive and for learning anatomy many specimens would be needed for one region to demonstrate all the essential anatomy. There may well be a place for plastinated specimens as an adjunct in learning anatomy but not as a replacement of dissection and the use of prosections.

Use of all of the above-mentioned

The time-honoured method of studying anatomy has been the process of dissection. With less cadavers available, increasing numbers of medical students and the limitation of both curriculum time and finances, each department of anatomy must find the most cost and time effective use of the above-mentioned methods of study. An essential for anatomists is to remember that they are encouraging students to learn anatomy to become practising doctors and not skilled professional anatomists.

Discussion

The General Medical Council (GMC) in 1993 issued recommendations on undergraduate medical education which included a revision of the curriculum towards one that is no longer all embracing but to one containing a core which is more rigorously defined than has been customary. It also detailed the goals and objectives of undergraduate medical education. They stated that students should acquire a knowledge of health and its promotion, and of disease, its prevention and management, in a context of the individual, the family and society. The student should become proficient in clinical skills and acquire and demonstrate attitudes necessary for the achievement of high standards of medical practice.

Since the GMC (1993) publication much discussion has centred on the medical curriculum. Prior to this, McGuire (1989) in a paper given at the annual meeting of the Association for the Study of Medical Education, raised questions rather than supplied answers. She outlined three types of needs: societal, professional and individual in order to educate doctors effectively. She stressed that those who educate must appreciate that the different motivations and talents of students studying medicine in the future may differ from those students with whom they are now familiar.

At the same meeting Professor David Shaw (1989) stated that a medical curriculum had to satisfy and defend variable needs: high standard of research creating curiosity and problem solving which influenced students and a need for medical education to relate to high standards of clinical practice. He also indicated the need to overcome in-built resistance and common inertia to change. Some of the common causes of resistance include fear of the unknown or partially understood, fear of becoming unskilled in an area where one was previously skilled, (e.g. where new teaching methods are introduced), lack of agreement with the need for change, protection of a vested interest, poor timing, and a threat to security (Grant and Grant; 1989). It is essential that all involved in any change should be adequately informed and should take part in discussion. It is our contention that students should begin to attain their goals during the first semesters of their medical studies which means while learning anatomy. This would mean that the majority of preclinical courses would need to reduce the amount of required detailed anatomical knowledge and to create a clinically applied core course, leaving time available for parallel learning of societal and professional issues.

When introducing such a core course which will be assessed by examination it is essential that the questions set should be based on the expected core knowledge. Questions can be straight forward but should also include questions which require the student to think. In the anatomy department of the University of Cambridge such a core

course has been developed, introducing moral and ethical issues and clinical skills parallel with the anatomical study. The core course provides the student with the basic language of medicine and thus will enable them to communicate sensibly with any other doctor whether generalist or specialist. From the core course the student should acquire knowledge which should remain forever. This can be emphasised during their course. Fasel et al. (1999) have found that a group of established general practitioners considered that 10% of the 623 entries in the International Anatomical Nomenclature under the human brain were of relevance in basic general medical practice. Twenty four entries were chosen as relevant by all the practitioners, 551 by none of them. Those students aiming ultimately to become specialists will learn the detailed anatomy of their specialty during their postgraduate training. Students need to understand the clinical application of anatomy invariably stimulating great interest, encouraging their learning (Satyapal and Henneberg, 1997). Reduction of the clinical content of the whole medical course is obviously undesirable and attention has turned to the time spent learning anatomy. Its traditional method of teaching has been in great detail and is time consuming. Many universities have reduced the hours spent in studying anatomy.

How students may best learn anatomy can be difficult to assess but all courses should be monitored. Feedback questionnaires are often returned by a limited number of students, 49 % in a series by Dinsmore et al. (1999). Many of those may be motivated to respond because they have some dissatisfaction with the course or difficulty in learning. Often their replies indicate a preference for rote learning to pass an examination and show resistance to problem solving. Similarly questions regarding the role of the different methods of learning, dissection, prosection, etc., vary greatly. Some show an enthusiasm for dissection, others regard it as a waste of time, although those students who were good dissectors were those who obtained distinction in the examinations (Leong Seng-Kee, 1999). Questions related to the performance of staff may promote useful constructive criticism or impertinence. Many remarks regarding the efficiency of the staff can be hurtful, particularly if great effort is being made to introduce a new course, modified to reduce the content they need to know, to make the course more clinically orientated and more interesting, but demanding more student effort which they do not realise is beneficial for deep learning and long term retention. It is important to have student feedback even if only 50 % are prepared to return the questionnaires. There are often ~ extremely useful points made, such as the timing or positioning of lectures in relation to other sections of the course. It must be assumed that the 50 % of students failing to return the questionnaires are satisfied.

Conclusion

The increasing content of the medical curriculum puts pressure on the preclinical subjects to be reduced in time and content.

Anatomy is one in which the evidence shows; learning is in great and unnecessary detail under traditional methods of teaching. Much of what is learned is forgotten after the examination. There is a need to develop core courses, providing a limited requirement of factual knowledge and the guide lines which should indicate the basis of anatomy to be retained by qualified doctors for ever. The course should encourage interest in the subject of anatomy by introducing its clinical application possibly with clinicians providing that input. The methods of learning will depend on the resources available, but it is felt that dissection is a vital and multifunctional introduction to the medical curriculum by providing a means of learning by discovery and by introducing medical ethics.

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