Making Gross Anatomy Relevant to Dental Students

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Abstract: This paper describes the curriculum design and enhancements of dental gross anatomy courses at three universities in North America. The greatest problem for gross anatomy faculty is making the regions of the body below the neck relevant to dental students for their future clinical education as well as the longer term dental practice. The proposed solutions demonstrated in the three courses range from satisfying the student's grade and test requirements, such as passing the anatomical sciences section of the National Board Dental Examination Part I, to making the material relevant to clinical dentistry. Strategies to increase relevance include incorporating clinical faculty into the gross anatomy course and integrating dental clinical material into the course. Lastly, pedagogical innovations include peer teaching, the use of the Internet and intranet for examination preparation, and the animation of dental procedures to illustrate relevant anatomy to dentistry.

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Most dental professionals get their complete basic science education during the first two years of professional dental school education. Unlike medical education, gross anatomy, particularly below the neck, is usually not presented to the students again during their professional development. Medical students undertake some form of gross anatomy study in later years by undertaking a surgical anatomy elective, studying radiological anatomy during their clinical studies, or minimally revisiting anatomy during their surgery rotations. At the same time, anecdotes, such as that experienced by one author (GDG) from dental accreditation visits, suggest that it is important for students to be more aware of the whole body and become more generally medically competent. Moreover, it would serve the dentist well if he or she came to understand the biologic (and anatomic) basis for making decisions regarding their patients. For example, when giving a dental mandibular nerve block, one should have knowledge of the pharmacokinetics of the anaesthetic agent as well as the anatomic basis for the procedure.

Anatomy is widely recognized as the basis for an indispensable component of most subsequent dental instruction. Curriculum guidelines for gross anatomy in dental education were initially published by the American Association of Dental Schools (now American Dental Education Association, ADEA) Section on Anatomical Sciences in 1981¹ and revised again in 1993.² Suggested core content, emphasized by inclusion on the National Board Dental Examination Part I (NBDE I) extends beyond the head and neck to include thorax, abdomen (including pelvic organs), and upper limb.³ Thus, the challenge to gross anatomists in dental schools is how to make gross anatomy, particularly the regions below head and neck, more relevant to dental students.

Why Is Relevance Important?

The term “relevance” has different meanings to different people. When the relevance of a particular component of the curriculum is considered, we should look at it from the perspectives of students, administration, and the overall relevance to the practice of dentistry. Relevance for students generally refers to whether or not the students perceive that the material will affect their grades, their ability to perform on standardized professional tests, and their ability to practice dentistry. Relevance to the administration is the importance the dental school administration places on the subject. Relevance to dentistry is whether or not the information is necessary and part of the professional life of a dentist.⁴

While it would be nice to suppose that all three components are equally important for course development, indeed, they are not. For many students, the perception of relevance, particularly to their grades, is often the single most important factor in time de-
voted to the course. For many administrators, relevance is how the information is reflected in the NBDE Part I scores. Gross anatomy accounts for 50 percent of the anatomical sciences section on NBDE I and includes neuroanatomy. The gross anatomy representation of the regions of the body on the anatomical sciences section of the NBDE I accounts for approximately 44-46 percent of the questions. The rest of the gross anatomy portion covers neuroanatomy. For most gross anatomists, relevance may be struggling to figure out how the structure of the body has anything to do with the practice of dentistry or finding new and innovative ways of making the geography of the body relevant to the clinical practice of dentistry. An initial step in this process is for the gross anatomist to learn about some of the dental procedures common to general practice as well as some basic dental anatomy. Basic dental anatomy ranges from jaw and tooth structure and the supporting tissues to an in-depth knowledge of the temporomandibular joint, infra-temporal fossa, and the oral cavity. Furthermore, the gross anatomist may be able to interact with dental specialists such as oral radiologists and oral and maxillofacial surgeons and dentists who specialize in temporomandibular joint diseases.

Case Studies of Gross Anatomy Courses at Three Dental Schools

At the University of Mississippi, these components were addressed by modifying gross anatomy instruction, in particular, with respect to relevance to the students. Thorax, abdomen, pelvis, back, and upper limb gross anatomy are taught in addition to the head and neck. Three instructional tools were used to increase relevance to the students. First, a textbook from which all exam materials were taken was mandated. Answers to all exam questions could be found in the textbook. Second, a website of supplemental materials, including PowerPoint lectures, individual student grades, and, most importantly, an interactive practice test, was developed. Third, a clinical correlation referring to dentistry was included in every lecture.

The website has received extensive use since its development. In its first year (1998-99), there were 12,621 total hits. In its second year, the total number of hits increased to 49,672. In the third year, there were 93,390 hits. The areas of the website that were accessed by the students remained relatively constant. Approximately 25 percent of all hits were to a practice test program (12,429 hits in 1999-2000; 23,678 in 2000-01). In both years, we had thirty students in the course, and the practice test was only available for material below head and neck. The practice test program is an interactive program that allows the students to answer individual questions. These questions are taken directly off old exams over the previous ten years.

While it is not possible to correlate student success on the NBDE Part I to the website, the students reported in a survey that they did not need to spend as much time preparing for the anatomical sciences part of the NBDE. NBDE scores have gone up over the past three years, and anecdotal reports from students indicate that they have been successful in answering almost all questions in gross anatomy. Additionally, students’ grades in the gross anatomy course have gone up significantly, although the faculty impression is that the course is no easier than before. Many factors, including the academic quality of the students who have been admitted and a recent change in the curriculum, may also account for aspects of these successes.

At the University of Saskatchewan, the dental gross anatomy course was developed with the aim of providing clinical relevance to all regions that the students study. For example, students are asked to identify the importance of the median cubital vein and the structures of the cubital fossa when setting up an intravenous line. Another example is helping the students understand the relationship between the urinary and gastrointestinal systems and drug elimination, thus highlighting why it is important for dentists to comprehend the structure and function of two systems that may, in the minds of students, seem far removed from the practice of dentistry. Furthermore, animations of dental mandibular nerve blocks or the temporomandibular joint as seen in Figure 1 make the sections of the head and neck anatomy clinically relevant and useful for later study.

To fulfill the goals of student learning at the University of Saskatchewan, it was determined that various student participatory activities would enhance the student learning environment. Laboratory activities were conducted on a peer teaching basis, where one group of students dissected while the other group did independent study. The first of these activities was a dissection presentation, which was a demon-
The dissection presentations encouraged the students doing the dissection to learn the material in greater depth.\(^8,9\) The second activity was in-class presentations on clinical syndromes. Lastly, a formative assessment activity modeled on the television game show *Who Wants to Be a Millionaire?* was put on the intranet server. This test-preparation (practice questions) activity was called “Who wants to be a second-year dental student?” Figure 2 shows the format of the questions. Course evaluation indicated that students enjoyed this activity very much and found it useful in studying for exams.

At the University of Kentucky, a recent reorganization of the first-year dental gross anatomy course included clinically relevant lectures, given by dental faculty, that covered the thorax and abdomen. During one of these clinical lectures, for example, students were suddenly made aware that a pregnant women sitting in their dental chair might experience lightheadedness that is quickly alleviated by moving the patient to her side to relieve pressure on the internal iliac veins and allow the blood to return to the heart. Disease states of the thorax and abdomen, mirrored by oral clinical presentation, were also emphasized. Table 1 illustrates the range of clinical lectures incorporated into the course. Student evaluations rated these lectures 4.5 out of a possible 5 (where 5 = “strongly agree”) for the statement “The clinical lectures helped me appreciate the relevance of regional gross anatomy to clinical practice.”

The use of computer-assisted instruction (CAI) has become commonplace at the University of Kentucky in teaching basic science and clinical aspects involving gross anatomy.\(^10\) As curricular demands increase and contact hours have been reduced, CAI plays an increasingly important role in the delivery of instructional materials earmarked for independent study—often integrating clinical relevance with the anatomical landmarks and spatial relationships they observed in dissection. CAI has proven to be particularly useful in anatomical instruction since it provides an effective and efficient way to assimilate visual materials and applicability to clinical relationships/relevance.\(^11\)

### Summary

This paper has provided a glimpse into the curricular design of three dental gross anatomy courses being taught in North America. These courses incor-

### Table 1. Clinical correlation lectures, dental gross anatomy at University of Kentucky

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porate innovations to help students understand the relevance of gross anatomy concepts to the dental practice as well as pedagogical enhancements. However, the primary goal should be designing gross anatomy courses to be more relevant to students based on their future clinical dentistry courses or, in the longer term, the dental practice. At the University of Mississippi, the innovations incorporated into our gross anatomy course appear to be associated with increased student comprehension and knowledge of gross anatomy and improved performance on the anatomical sciences section of the NBDE Part I. The latter achievement should therefore make dental school administrators very pleased.

REFERENCES