AN@TOMEDIA™
A NEW APPROACH TO MEDICAL EDUCATION DEVELOPMENTS IN ANATOMY

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Abstract

An@tomedia™ is an intuitive, interactive, self-paced learning program of anatomy on CD-ROM. It provides multiple perspectives for the nine modules of the human body (back, abdomen, thorax, general anatomy, upper limb, lower limb, pelvis, neck, head) each of which is independent and of equal importance. 'Dissection' incorporates practical (including emergency) procedures and postmortem images, 'Imaging' incorporates sectional and endoscopic anatomy, 'Regions' incorporates surface and functional anatomy, 'Systems' incorporates conceptual and clinical anatomy. The program features creative visuals with graphic overlays, diagrams and explanations which provide a simpler conceptualisation of the complex reality. The user can choose the order and rate in which they study the body, their direction of learning about it (by construction or by deconstruction) and the degree of detail (with optional text, overlays and 'rollover' identifications at every screen). An@tomedia™ is a valuable resource for all medical and allied health professionals, allowing anatomy revision with a clinical and applied emphasis. Alternatively, users may simultaneously upgrade their own understanding while engaging in patient education. An@tomedia™ may also be utilised to help patients learn about the anatomical basis of a relevant clinical procedure (eg. arthroscopy) or surgery (eg. laminectomy) that may be required or have occurred.

Keywords

anatomy, imaging, dissection, regions, systems

Anatomy is the core subject underpinning medicine and health related sciences. It describes the normal structure of the human body and forms a springboard for the later study of abnormality. Dissection is ideally the most valuable means of gaining an understanding of anatomy. However, it is difficult technically, logistically complex, time consuming and expensive. In currently crowded health sciences curricula (and with the increasing development of new subjects and integrated systems/problem-based curricula) these issues are coupled with less time to make sense of anatomical knowledge or (more importantly) integrate such knowledge in a clinical context. Practitioners are faced with different learning challenges. They frequently need to 'brush up' on their anatomical knowledge within a clinical or applied context, where time constraints require fast and easy access to information. Both features are rarely found in current textbooks of anatomy.

AN@TOMEDIA ™ is an attempt to redress some of the above problems. It is being completed in the context of a new practical anatomy teaching program developed at the University of Melbourne in response to feedback from students urging the construction of a guided dissection, on computer, that

can be used interactively. A text, compatible with this program, has already been designed and piloted.

There are already many types of learning materials in anatomy. Computer tutorials (eg. Anatomy Project', 'Slice of Life'), point and click browsing systems (eg. 'ADAM', 'Integrated Medical Curriculum', 'Bodyworks'), electronic reference atlases (eg. 'Elsevier's', 'Netter' and 'McMinn'), data bases (eg. Glaxo Virtual Anatomy') and videos of dissection (eg. Clemente, Ackland) are all of use, but have the limitation of not being interactive in all aspects of learning. This interactive multimedia CD-ROM contains dissections of the entire body (including over 2000 individual anatomical images), together with full interactive text and graphics.

AN@TOMEDIA ™ encompasses nine modules, each of which is independent and of equal importance. The modules are (1) Back, (2) Abdomen, (3) Thorax, (4) General Anatomy, (5) Upper Limb, (6) Lower Limb, (7) Pelvis (8) Neck, (9) Head. Multiple perspectives are provided for each of the nine modules: *'Dissection'* includes practical (including emergency) procedures and postmortem images, *'Imaging'* incorporates sectional and endoscopic anatomy, *'Regions'* incorporates surface and functional anatomy, *'Systems'* incorporates conceptual and clinical anatomy.

AN@TOMEDIA ™ is unique in that it uses real human bodies (prepared and photographed in each stage of dissection, layer by layer from skin to bone) complimented by sections, imaging and procedures that enable the user to both construct and deconstruct the human body *interactively*. Creative visuals with graphic overlays, diagrams and explanations provide a simpler conceptualisation of the complex reality. The program also highlights the comparative appearance of 'fresh', un-embalmed dissections.

Operators can choose the order and rate in which they study the body, their direction of learning about it (by construction, via systems and regions or by deconstruction, via dissection and imaging) and the degree of detail (with optional text, overlays and 'rollover' identifications at every screen). The specially designed protocol enables them to 'build' systems, 'assemble' regions, 'trace' radiological images, 'map' surface landmarks and 'discover' underlying anatomical concepts, all on computer. They can alter their approach at any time and view the same anatomical structure from a different perspective (eg. a lumbar puncture followed by an x-ray of the spine then a dissection series).

The intended learning outcome is that by using *AN@TOMEDIA* ™ the viewer will be able to identify and interpret the normal structure of the human body. Specifically:

- the subdivision of the human body into regions and the organisation of structures which contribute to a common function into systems (correlating structure with function)
- the anatomical structures exposed by dissection and observed, palpated or pierced in practical (including emergency) procedures
- the surface markings and applications of clinically important structures
- the appearance of the human body in section at important planes and of normal structures in radiological images
- the differences in appearance of post-mortem (un-embalmed) images in contrast to embalmed specimens.

Figure 1: Menu screens showing module and perspective selection for AN@TOMEDIA ™

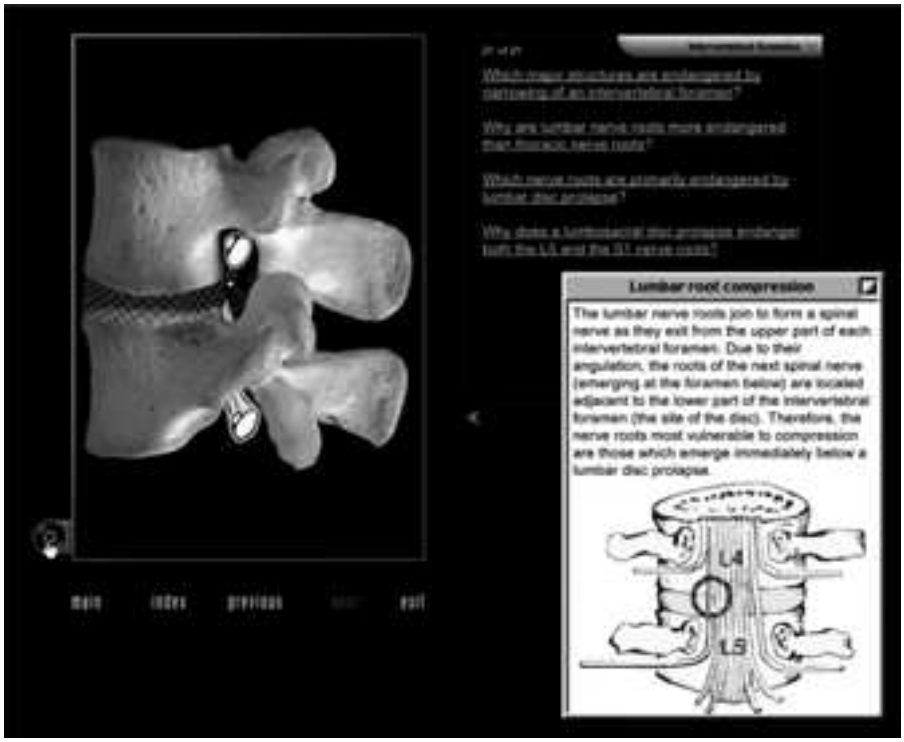

Figure 2: Sample screen from AN@TOMEDIA ™

AN@TOMEDIA ™ is also a valuable resource for the practitioners, allowing anatomy revision with a clinical and applied emphasis, as well as the option to explore the program choosing their own rate, order and level of learning. Alternatively, the clinician may simultaneously upgrade their own understanding while engaging in patient education (eg. accessing relevant information from the CD-ROM with the patient). *AN@TOMEDIA* ™ may also be utilised to help patients learn about the anatomical basis of a clinical procedure (eg. arthroscopy) or surgery (eg. laminectomy) that may be required or have occurred.

Figure 3: Sample radiograph showing rollover 'hotspots'

Assessment

AN@TOMEDIA ™ has the capacity to profoundly affect assessment (both formative and summative). Integrated into the design of the program are questions relating to the anatomical basis of clinical phenomena. For example, the viewer may interpret an image of a dissection of the back displaying the typical site where a bulging intervertebral disc may compress the roots of a particular lumbar spinal nerve. A range of related questions could be posed to interpret the clinical symptoms and signs and relate them to the specific lesion displayed. This is the basis of future collateral programs interpreting the program into the clinical setting.

Evaluation

Two comprehensive (both quantitative and qualitative) evaluations have been completed. The first by 132 first year medical students at the University of Melbourne and the second by eight external evaluators (including content experts in anatomy, surgery and education from Australia and overseas). The results of both evaluations have been overwhelming positive (Kennedy, Eizenberg & Kennedy, 2000) and these will be discussed.

The first two modules ('Back' and 'Abdomen') are completed and are commercially available. Eventually, the content for each module may be available for distribution on a single CD-ROM, alternatively all nine modules may be purchased on one CD-ROM. Practitioners will also be able to choose combinations of modules, such as 'The Back, Upper Limb and Lower Limb' for those primarily interested in the musculoskeletal system. The forthcoming two modules Thorax and General Anatomy will be demonstrated.

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