Teaching Anatomy Using Multimedia

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ABSTRACT

New and continuing advances in information technology have contributed to the possibility of creating teaching materials in a more accessible, interactive and highly visual style. Furthermore, there is a general movement towards enabling and encouraging student centered learning. This has led to increased recognition of the need to move away from teaching where students play largely passive roles towards learning where students are actively involved. Multimedia technology and the World-Wide Web offer a realistic way to promote student-centered learning in medical curricula while maintaining overall quality of learning within a university. This paper presents the development of a multimedia resource that seeks to teach anatomy using videos of laparoscopic anatomy and other multimedia tools. This resource demonstrates the entire process of a laparoscopic cholecystectomy. It includes illustrated anatomy, embryology with animation, clinical markers, and a narrated video encapsulating important aspects of the procedure from both anatomic and surgical points of view. *TSMJ May 2000, vol 1, 18-20.*

INTRODUCTION

There is growing interest throughout the educational sector as a whole on the potential of Information and Communications Technology (ICT) to support both teaching and learning.[1] ICT may be used in conventional, flexible and distance education to support teaching and learning, whether it is one-to-one, one-to-many and/or many-to-many. It may be synchronous, occurring at the same time interactively for all participants as in video-conferencing, or asynchronous, occurring at different times for different participants as in email or web-based course delivery.[1] There can be no doubt that the World-Wide Web offers great potential for the delivery of asynchronous distance learning education. However, it is not just a question of putting the lecturer's notes or visual material on the web. To be effective, the course must pass on the most information to the user in a way that does not overwhelm and in packets that are easy to manage. An ideal resource would be able to anticipate logical paths a student may follow and provide the necessary
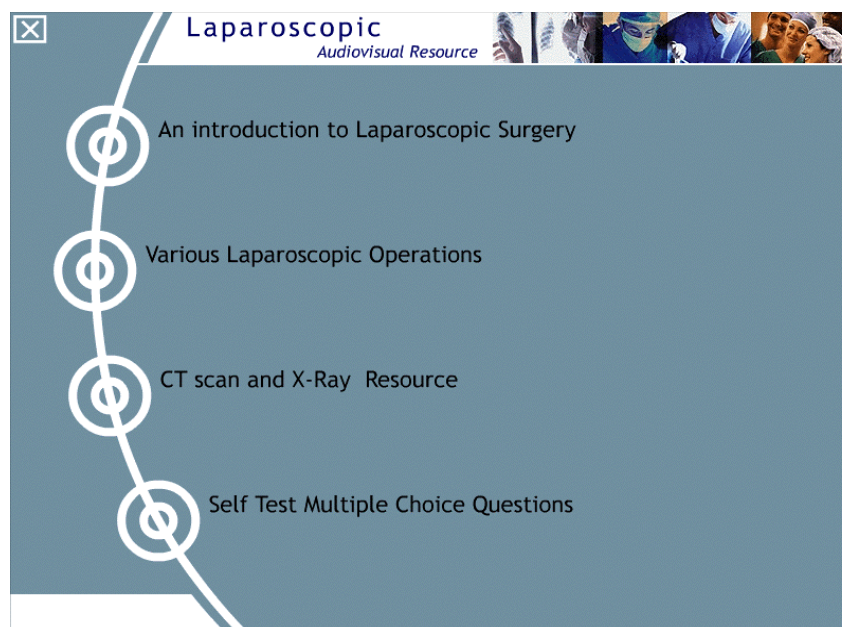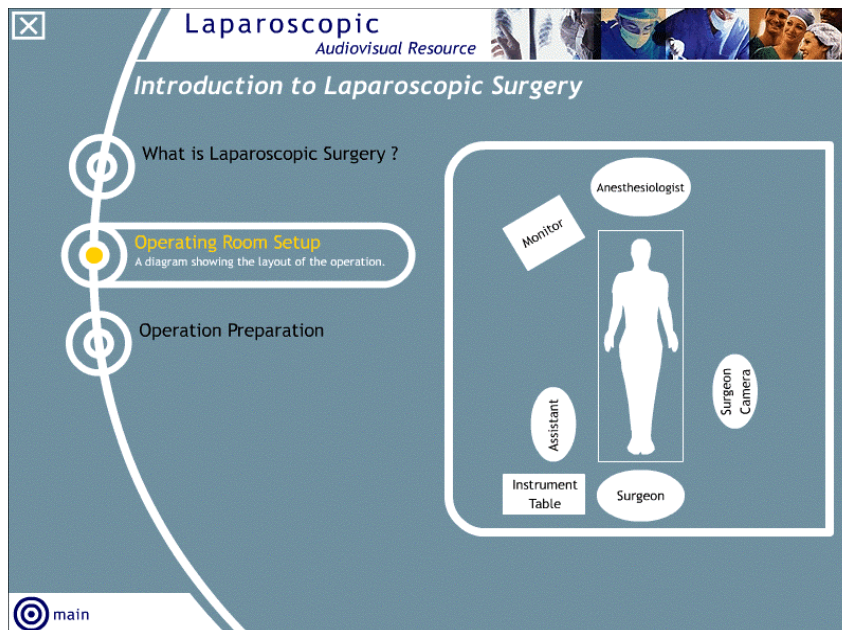

Figure 1: Main screen with menu

Laparoscopic
Audiovisual Resource

An introduction to Laparoscopic Surgery

Various Laparoscopic Operations

CT scan and X-Ray Resource

Self Test Multiple Choice Questions

Figure 2: Diagram of operating theatre

degree of resources, interactivity and have a proper instructional design. Indeed, the Web offers the possibility of enhancing the educational experience at a local campus level, as well as for remote students. This may reduce some of the negative effects of increasing class size, expanding curricula, added time pressure on students and lecturing staff, and contention for library resources. Also, lectures may not be the most effective means of delivering educational material to large classes. In fact, the General Medical Council education committee in 1993 discussed their recommendation for the promotion of the merits of learner centred and problem oriented approaches to learning.[2]

Four basic principles for successful on-line (networked) learning environments have been identified, namely; high volume of content, user friendly interactivity, quick response time, and logical organisation of course materials.[3]

This paper focuses on the development of a prototype course unit based on the above principles for the teaching of anatomy and is aimed at students in the Health Sciences Faculty at Trinity College, Dublin.

It integrates laparoscopic video with text and images into a multimedia presentation. The prototype recognises that new ways of stimulating and motivating students are required which exploit these 'tele-technologies' effectively. Early experiments have proven that course composition, presentation and assessment need to be redesigned in order to produce effective courses.[4]

OVERVIEW OF THE COURSE

The prototype has been structured in such a way as to facilitate the addition of new educational material as well as being adaptable for the presentation of other topics in addition to the trial domain of laparoscopy. At this stage in development of the resource, four laparoscopic operations have been developed incorporating modules for anatomy, embryology, clinical signs and symptoms, along with interactive multiple choice questions. Operations included laparoscopic cholecystectomy, inguinal hernia repair, Nissen's fundoscopy and laparoscopic sympathectomy. The operations were filmed at the Adelaide and Meath Hospital incorporating the National Childrens' Hospital at Tallaght. A video introducing the principles of laparoscopic surgery has also been incorporated.

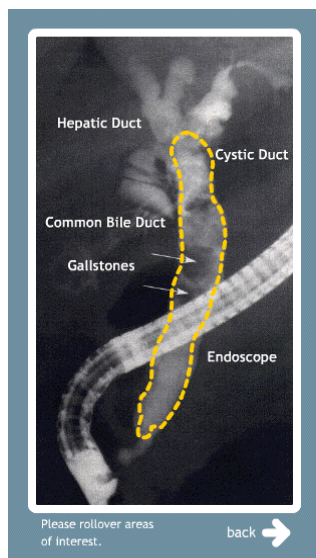### 2.1 Introduction to Laparoscopy

The main screen (Figure 1) provides a menu with the option of an introduction to laparoscopy, the laparoscopic surgeries themselves, a CT and X-ray section, and a multiple choice question section for self-assessment.

The 'Introduction to Laparoscopy' module includes other teaching modules showing the setup of a laparoscopic operation accompanied by an explanation of the procedure, clinical reasons and comparisons between open and laparoscopic surgery. A vector diagram was also used in showing the setup of the operation (Figure 2).
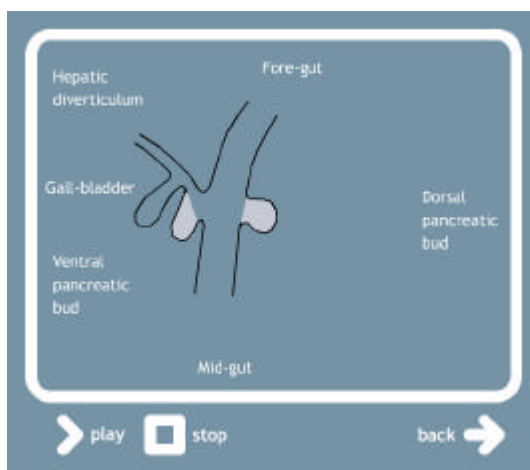
2.2 Laparoscopic surgery

In the "Various Laparoscopic Operations" Laparoscopic module, which is the key part of this teaching prototype, there are four operations listed. In each operation, there are four sections detailing the Anatomy, Embryology, Clinical Presentation and the video of the surgery itself. Information for each section was based on material drawn from a wide variety of textbooks and with the advice of the Departments of Surgery and Anatomy.

A number of new and existing technologies were utilised in the production of this prototype. A

back

Figure 3
(above):
Embedded text
image
Figure 4
(right):
Animated
embryology
diagram

variety of new techniques in multimedia were incorporated into this section including the use of embedded text to image linking (Figure 3). This occurs when the mouse is passed over a section of a diagram and a text box opens up explaining the name of the organ and its function. The organ in question is then highlighted by a dotted line around it. This can work on either a picture or an X-ray.

The embryology segment (Figure 4) shows the development in the foetus of the pancreas, gallbladder and liver. The use of animation in embryology is

particularly powerful as it is hard for the student to visualise from text and pictures alone. Macromedia Flash 4.0™ was used to design this segment of the program. It also shows the rotation of the ventral pancreatic bud clockwise behind the mid gut to join

up with the dorsal pancreatic bud.

Conclusions

The course unit was developed using Macromedia Director version 7.0™, Macromedia Flash version 4™, Macromedia Shockwave™ and Quicktime™. The video of the surgery was taken using the Keymed laparoscopic system onto S-VHS tape and was incorporated via mjpeg compression and a DAT script recording into a Shockwave file. The use of Macromedia Director, Flash and Shockwave is important as these are web-enabled programs. Hence, these programs are Internet compatible and can be easily updated in order to incorporate new educational material.

The use of the mjpeg compression allows the video and audio to be viewed at an acceptable size and quality. The videos were also kept short with succinct commentary so that the student would not lose attention.

It is planned to make the material available to undergraduate students in Health Sciences via the College Internet and to evaluate the use of material and the effectiveness of the learning outcomes. This will provide the foundation for a complete teaching unit incorporating, for example, chatrooms in which lectures and students can interact, as well as X-ray and CT resources to provide more comprehensive coverage. Such interactive courses in which students are free to follow at any time provide an excellent opportunity to enhance their learning experience, while at the same time reducing to some degree the pressure on the curriculum and negative effects of large classes.

Future goals include linking up with a global network of medical schools as is already being done currently in Europe.[5] There is also a deep interest in the reforming of medical curriculum and evaluation of new developments in healthcare informatics.[6] It is hoped that this course unit will aid students in self-directed learning as an adjunct to formal teaching.

References

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