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Short Course 13

Pre- and postgraduate teaching in pathology

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Modern communication systems for teaching and education

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Introduction

Modern communication technologies open up fascinating new ways to achieve a higher level of student teaching and postdoctorate education in the field of pathology, as well as in the continuing education of senior pathologists. The number of macroscopic and microscopic images is more or less unlimited, the direct connection between these two types of images along with clinical data can be supplied without problems, and even moving screens can easily be produced and delivered to the learning audience. The distribution of general knowledge and new developments is fast and relatively simple.

Teleteachina

This approach is directed preferentially to student training. As support material for the classic one-person lecture and small group lesson the virtual reality approach is very helpful and informative; for instance, surgical specimens from the operating room can be used as a macroscopic demonstration in 3-0, and can therefore be much more instructive than the static 2-0 images. The students will achieve a more realistic impression of what goes on in pathology laboratories. With the link between the clinical situation and patient-related data using freeze-frame diagnosis, conventional biopsies or surgical specimens can be explained using many cases, even in the current cases. The lecturer can impressively underline importance of pathology when the great responsibility is presented in a convincing manner.

Teleconsultation

This approach opens the possibility for partners or groups, *e.g.,* students, junior and senior pathologists as well as surgeons, radiologists etc., to communicate in a direct and active way and discuss educational and diagnostic problems on a general or case basis. Improving the exchange of experiences in order to attain a more reliable diagnosis has become a reality which is not limited by geographical distance. For example, a pathologist in the United Kingdom is able to directly discuss and control the solution to a problem or the diagnosis of a rare case by exchanging information with an German or American expert and vice versa. Time-consuming, labor-intensive and costly exchange of specimens by post or other means of transport can be avoided.

Teleconsultation also allows pathologists to obtain a second opinion on a difficult case. The pathologist would take 10-20 digitized pictures with an appropriate camera and send these images together with adequate data on the case to the server of another pathologist who is expert in the field to be discussed. The expert could then work on the case with no time constraints. After the diagnosis is made, he or she would then send back the "second opinion. This system is relatively inexpensive since no special connection lines are needed. In particular, it is appropriate when long-distance interaction involving a time gap is necessary.

Pathology databases are in the process of being established and would create a reliable means of assistance in the diagnosis of a rare case or for use for personal training. When this cumulated knowledge is open to the public, it will be of paramount importance for improving the level of pathology.

Furthermore, teleconsultation makes possible the global distribution of new developments in diagnostic standards, e.g., tumor-node-metastasis system of the UICC, terminology etc., as well as direct and quick access to current information on new developments.

New methods can also be delivered and explained to other institutions very easily and discussion on their reliability becomes more global. For example, direct interlaboratory checking and comparison of DNA cytophotometry, comparative genomic hybridization (OGH), loss of heterozygosity etc. has become possible. The exchange of experiences with the specificity and sensitivity of a new antibody, and its relevance in the diagnosis of a special case, etc. can be discussed between two or more laboratories in a direct and rapid way which includes many images, data and information. Even routine immunohistochemical images can be discussed between experts who are separated by great distances. All these new interactions raise the possibility of improving the quality of the educational and diagnostic work in experimental and surgical pathology, in addition to expanding it to an international scale. Two levels of interaction need to be distinguished: teleteaching and teleconsultation

Requirements

The technical problems have almost been completely solved (1, 2), and the requirements are simple and inexpensive. At the most basic level, a telephone line and a simple digitizing microscope-camera are sufficient. Higher levels of technical equipment, such as a high capacity server, high quality digital cameras, large screens for professional presentation etc., would indeed increase the possibilities and facilitate the communication. The development of the adequate software and hardware occurs extremely quickly and will open further new possibilities and applications in the future.

Problems

The general limitation of telepathology lies in the fact that human communication cannot be totally replaced by a technical system. It is impossible to get a feeling of the density (and smell) of the macroscopic material.

There are still some limitations with regard to the microscopic image and the size; the direct reading of a slide also requires a high power connection such as ATM, and the costs of such high power lines are still considerable. However, technical developments occur quickly and will be able to overcome these shortcomings in the near future.

Conclusions

New communications technologies facilitate many tasks in the current work of pathologists. This includes education, routine diagnostic work and answering scientific questions and involve the following possibilities:

i) General and surgical pathology can be taught in a more direct and fascinating way.
ii) The exchange of experiences on histology, new technologies etc. is facilitated.
iii) A second opinion can be achieved easily and quickly, thus leading to greater safety for the patient and physician.
iv) New diagnostic standards can be widely and quickly distributed.
v) All these improvements can be attained independent of geographical distance.

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New approaches to testing medical students

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Multiple-choice questions are widely used for testing knowledge of medical students in North America, while oral examinations and written, essay type examinations, remain the standard means of assessing students in Europe and other parts of the world influenced by the European approach to medical education. Each of these two modalities seem to offer some advantages and some disadvantages. Multiple-choice examinations are more suitable for simultaneous testing of large numbers of students, and are easier to standardize. On the other hand, individual oral or written examinations can be customized more easily and are thought to more accurately assess students' 'real" knowledge and understanding of concepts. Multiple choice questions often deal with minutia and by design, the answers are preselected by the examiner. Such questions favor recognition and are more suitable for testing knowledge ot facts rather than concepts. These tests are considered by many educators to be far removed from real life situations in which the practicing physician will not be given a preselected list of possible choices but rather complex problems that cannot be reduced to five choices. Oral examinations could, however, be rather subjective and the criteria could vary considerably from one examiner to another. The number of topics covered in a typical oral examination is small in comparison with the broad range of topics that can be included in a multiple-choice examination.

In an effort to retain some of the advantages of standard multiple-choice examinations but also expand their scope and introduce more flexibility in their application, we have explored new modalities of testing medical students. To provide data that such new testing methods give acceptable results, we have compared new testing formats known as "extended matching" and open-ended "uncued questions" with multiple-choice questions. We have also introduced computer-based testing and have devised new ways of testing students' knowledge of microscopic and macroscopic pathology.

Over a period of 10 years we performed a series of studies at Jefferson Medical College in Philadelphia, and the University of Kansas School of Medicine, Kansas City, and have shown that new modalities of student testing can increase the psychometric validity and reproducibility of examinations. Examinations based on uncued questions and extended matching proved to be superior to those based on multiple-choice questions.

The popularity of new testing modalities varied considerably among students. Most students were opposed to open-ended uncued questions, which were, however, considered by the faculty to reflect best the "real knowledge". Extended matching questions and computer-based testing were received well by students of both medical schools.

We have also noticed a change in students' approach to studying pathology and their ability to integrate their knowledge of this discipline with other basic science subjects. Computer-based examinations stimulated students to actively use their computers during the course and have increased their computer literacy and enthusiasm for informatics and use of computers in medicine.

The response of the faculty was mixed, but over a period of time most instructors became familiar with constructing questions in the new formats and became more enthusiastic about the novel testing system. New computer-based courses were developed and with some modifications, one of them was transferred to the University of Zagreb School of Medicine, Zagreb, Croatia.

The results gained by introducing new testing modalities have shown that the testing methods currently used for assessing students' knowledge can be improved. The introduction of new testing methods could have a positive effect on students' approach to studying pathology.

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