GUEST COLUMN

VIRTUAL MICROSCOPY - TECHNOLOGY OF THE NEW MILLENIUM

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INTRODUCTION

Health care in India is making rapid strides in every field. Last two decades have witnessed rapid growth and digitalization of the health care. Many aspects of patient care and record keeping are now becoming Information and Communication Technology (ICT) based. This change has resulted in world class medical care in India leading to booming medical tourism.

However digitalization not yet become part of medical and dental education. Hence there is a mismatch in the training of medical graduates and postgraduates in digital world and the requirement and expectations from them. Young dental doctors trained in India are at a disadvantage when they go for further training to other developed countries. There is an urgent need to focus on this issue and take remedial measures in this field. Similarly digitalization in diagnostic services especially in the field of telepathology has not kept pace with the developments taking place in this field particularly virtual microscopy.

VIRTUAL MICROSCOPY-TECHNOLOGICAL INNOVATION

Last decade has seen attempts at improving the methods employed in telepathology. This had led to the development of virtual microscopy which produces virtual images and these images are gradually replacing the static images as preferred toll of telepathology. Virtual images are playing greater role in e-medical and e-dental education than what initially was envisaged.

Virtual microscopy is the process of producing virtual images with the help of an advanced microscopy called virtual microscope. Virtual microscope is a trinocular microscope with robotic control of various adjustments like brightness of illumination, movement of mechanical stage in X and Y axis, change of objective, coarse and fine focusing of the section. Slide kept on the stage is scanned in the magnification selected and hundreds of pictures are taken of the section by automatic movement of the equipment which therefore is also called Digital scanner. Each field of section is autofocussed before capture of image. On compilation of scanning, the picture captured in millions of pixels is stitched and blended together with the help of software to finally produce a composite picture which is exact replica of the tissue section. The image thus created is automatically stored in the computer.

This image is called Digital slide or whole slide image, virtual Image and has the characteristics of the original section. If the staining quality of the section was not optimal, quality of the image can be improved in terms of colour saturation, brightness and contrast with the help of software. Digital slide can be viewed on the screen of the PC or laptop in any magnification just like a glass slide is viewed under the microscope and any area of the slide can be viewed. Image can be annotated to point out salient features which are very useful for undergraduate teaching.

APPLICATIONS OF VIRTUAL MICROSCOPY

1. Telepathology

The main application of virtual microscopy envisaged initially lies in telepathology for primary consultations and second opinion from expert consultants. Slides from a smaller centre equipped with the virtual microscope are converted into digital slides and these are transmitted to a centre of excellence to consultant pathologist who views the slide in digital form and sends opinion to the referring laboratory. Technology has tremendous potential for India which has a pool of excellent dental institutions at par in excellence to any other institution in the world and specialized centres for various diseases. These centres can become digital pathology hub in future just like teleradiology and medical tourism in India. Telepathology can be done using static images or the whole slide images. The limitation of telepathology using static images has limitations as the area selected for consultation is dependent upon the referring oral pathologist while whole slide images have no such bias. Telepathology allows consultation and interactive case discussion, implementation of uniform protocols extremely helpful in standardization of report and medical terminologies and creation of pool of teaching material for mutual use.

2. Medical Education

Digital whole slide images are going to bring revolution in medical education and usher in era of e-medical education. Futuristic class rooms will be devoid of microscopes and will be equipped with PCs of laptops. Professors will be showing whole slide images instead of showing microscopy glass slides and students will be viewing the images on their laptops. This technology will be highly effective for self learning.

The whole slide images will become instrument of bringing uniformity of teaching in various institutions as images will be duplicated and distributed in the collages across the country. Next few years are going to witness improvement in the quality of dental education and bring it at par with global centres of excellence.

3. Storage and cataloguing of teaching material

Digital slides will completely revolutionize

storage of slides in the departments of oral pathology. Instead of glass slides, cases will be stored in the computer disks. Compilation of cases will be computerized and retrieval will be easy. Physical space will not be required for storage of slides.

It remains to be seen how soon the resourceful institutions in the country take initiative in promoting technology adaptation and diffusion among the oral pathology and dental anatomy community to explore the full potential of this innovative technology. In the interim period private players concerned with medical education are initiating the process.

REFERENCES

1. Samraj T. Virtual microscopic method of teaching histology. JOHS 2011;2(1):43-4.
2. Betigeri AM, Aparna P, Pasupathi P: Could India become the digital pathology hub of the future? A consideration of the prospects telepathology outsourcing. Int J Biol Med Res. 2010;1(4):300-2.
3. Baruah MK. The practice of telepathology in India. J Posgrad Med. 2005;4:316-8.
4. Weinstein RS, Graham AR, Richter LC, Barker GP, Krupinski EA, Lopez AM, Erps KA, Bhattachryya AK, Yagi Y, Gilbertson JR. Overview of telepathology, virtual microscopy, and whole slide imaging: prospects for future. Hum Pathol. 2009;40:1057-69.
5. Dee FR. Virtual microscopy in pathology education. Hum Pathol. 2009;40:1112-21.