

Telecytology - Three Years of Experience in Military Medical Academy

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INTRODUCTION: *Digital imaging have many applications in pathology and cytology that encompass training and education, image analysis, diagnosis, report documentation and archiving, and telecommunications. Telepathology/telecytology involves the use of telecommunications to transmit pathology/cytology images for the purposes of diagnosis, consultation or education. Slowly developing telecommunication network, uncoordinated quality control system in pathology, in association with serious economic problems have interfered with the progress of telepathology activities in our country. Regardless, development of digital imaging and telepathology/telecytology in last years was taken an important place in Institute for pathology and forensic medicine of Military Medical Academy. Primary aim of this paper is the presentation of our first experiences with reference to theirs accuracy and quality assurance through the specificity of static consultation system used.*

MATERIAL AND METHODS: *They are two basic systems for telepathology or telecytology, dynamic and static. In an dynamic sistem, the telepathologist or telecytopathologist can control a robotic microscope at the remote site, while in a static sistem the telepathologist or telecytopathologist makes the diagnosis based on the microscope images that have been selected, and transmitted, by someone in the remote hospital. We are developed the static system for remote consultation based in relation between relational databases model and WWW, which we are using in manner to having us some real-time interpretabilities. This static system was used also for the teleconsultations with the Armed Forces Institute of Pathology [AFIP] (Washington D.C.) and with the Institute of pathology University in Udine, Italy.*

This system worked reasonably well, but it didn't allow to do what we felt was a critical part of the review process: scan the glass slides in real time to select exactly the right fields, focal depth, and magnification. The dynamic telepathology systems he was familiar with were far too expensive and cumbersome to justify for what we needed: simple, compact equipment that would cost well under 10000DM per seat.

We have configured our dynamic telepathology based on VCon Cruiser, a multimedia information - videoconferencing card, for routing and processing of digital and audio-video information. It plugs into any PC's PCI slot and comes with VCon 1-CCD camera. The standard based (H.360) codec is configured for ISDN transmission at 128-384 Kbps, and to capture images at FCIF resolution (352 pixels x 288 lines). Also is allowed LAN transmission capability (H.323) at 64-1564 Kbps. There is port to connect another video camera (for a microscope), VCR or video output from other imaging medical devices (ultrasound, endoscopic camera, etc).

RESULTS: *Last three years pathology division of Military Hospital in Nis, 250 km away from a Belgrade, sending us, via POTS, multimedial documented requests for remote consultations in pathology and cytology. All of cases were imaged using the Sony DXP 1-CCD camera, Philips 490 1-CCD camera and Pixera digital camera, at a resolution from 768x574 to 1024x768 pixels. The study was performed to estimate the efficiency*

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and the diagnostic accuracy of the static telepathology in the consultations of different cytology cases as well as to demonstrate our experiences in static telepathology services. Our first experiences based on 62 cases of telecytology, which was clinically evaluated, in period 1999 - 2000, are characterized with high level of accuracy and quality assurance. 86% of all cases are definitive resolved in first remote consultation. 12,5% of cases are also definitive resolved after: repeat sampling procedure, necessary of clinical datas or images. Definitive concordance between telecytologic and glass slide diagnosis was 99%. Only in one case definitive diagnosis was made by glass slide observation. to a) definition of potential areas with competent information (CI, low magnification), b) confirmation of location of interest (LI, moderate magnification), and c) selection of areas useful for definite diagnosis (DD, high magnification). A fast analysis of gray value distribution can be used for measuring the CI, syntactic structure analysis for LI, and morphometric measurements (DNA analysis, etc.) for DD. These systems require active telepathology for implementation into a telepathology network. In addition, the selected features can be handled by passive telepathology when AI systems such as neuronal networks or Bayesian decision systems are used.

DISCUSSION: Implementation of telepathology facilitates the communication between pathologists and benefits by the teleconsultations with expert pathologists. The static-image telepathology system used in our study to provide consultations for difficult cytology cases highlights telepathology importance for making a final proper diagnosis. Telecytology final diagnoses were important for the clinical decision in each of cases. There are high level accuracy of telecytologic diagnosis in literature reports. Agreement between the telecytologic and glass slide diagnosis ranged from 80% to 96%. Static systems for both telepathology and telecytology, which have the advantage of considerably lower cost, appear to have lower levels of accuracy. Study designs are based usually on determined numbers of cases (malignant and benign) which were imaged with 5-9 selected images per case. Case histories and images were assembled into hypertext documents. High level of agreement between the telecytologic and glass slide diagnosis in our experience are related with their reference on adequate education and training for telepathology services, both referring pathologist and telecytologist, and specific configurations of our teleconsultation system. The proper selection of the microscopic fields by referring telepathologist as well as the experience of our telecytologists helped to solve the diagnostic problems or improved the quality of diagnoses. The implementation of static telepathology remarkably shortened the time of consultation and allowed for early therapy. Our study proved the efficiency and high diagnostic accuracy of static telepathology for the diagnostic consultations in the difficult cytology problems.

CONCLUSION: Digital imagery applications will continue to present new opportunities and challenges. The aim of this paper are directed toward assisting the profession to stay informed and in control of these applications in the laboratory. Telepathology and telecytology is an area in particular need of studies of good quality to provide data on factors affecting accuracy. New technologic approaches to addressing the issue of selective sampling in static image consultation are needed.

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