



SUMMARY

TELEPATHOLOGY: GUIDELINES AND TECHNICAL STANDARDS, LITERATURE REVIEW

Telepathology is a specialized field of telemedicine. It is the practice of anatomical pathology at a distance between two or more distant facilities using a microscope (or a slide scanner), a telecommunications medium, and a workstation for the consulting pathologist. The aim of telepathology is to provide pathology services at a distance when there is no on-site pathologist.

Depending on whether the communication between the facilities occurs in real-time or delayed-time mode, telepathology is considered static or dynamic. Static telepathology consists in capturing, digitizing and transmitting images of a gross or microscopic specimen to a consulting pathologist, who can view them on a screen and interpret them. As for dynamic telepathology, it involves transmitting and viewing in real time histological images from a microscope located at a distant facility. A literature review revealed that both types are, with their advantages and drawbacks, useful in diagnosing, obtaining a second medical opinion or in teletraining.

In the case of static telepathology, research on static image transmission concludes that the relatively numerous sources of error are associated with the choice of photographed fields. The possibility of digitizing an entire glass slide, referred to as a virtual slide, has reduced these sampling problems, thus improving the diagnostic reliability of static telepathology. The possibility of delayed transmission and the fact that the virtuality permits, among other things, the making of identical copies, fast transmission, and archiving, are substantial pluses of the virtual slide.

The results of research on the diagnostic reliability of dynamic telepathology are very convincing. It enables one to operate a microscope from a distance and, therefore, to work as in conventional light microscopy. In addition to distance diagnosing, dynamic telepathology is useful in

teaching and scientific research. Presently, its main drawbacks are of an economic (the cost of the equipment) and technical (slow operating speed and the difficulty focusing with these systems) nature, and it requires high bandwidth. All of these technical limitations can be overcome with technological advances.

The different applications of telepathology identified in the literature can be grouped into three main categories: the extemporaneous examination (an examination performed during a surgical procedure), the obtaining of a second medical opinion, and teletraining. In the case of the extemporaneous examination, telepathology is very useful when there is no pathologist at the location where the specimen is obtained. Sending static or dynamic images of specimens or histological tissues to a pathologist has the advantage of enabling one to obtain a diagnosis in order to guide the surgical course of action. Since there is not a pathologist at every facility where surgery is performed, the time gain constitutes one of the main advantages of the extemporaneous examination by telepathology. With the elimination of geographical barriers in telepathology, obtaining a second medical opinion, especially when examining difficult cases, becomes possible and provides access to specialized expertise. As for teletraining, it is one of the applications that benefits the most from the advantages of telepathology.

In light of the analysis of the advantages and drawbacks of telepathology, both static and dynamic, and of their applications, it emerges that the virtual slide offers the best solutions to most of the problems associated with distance and the lack of pathologists at remote hospitals and constitutes the best compromise.

To properly carry out telepathology, two technical conditions must be met: the institution must

have equipment that lends itself to the planned application, and the technical standards must be met to ensure that the transmitted data are of suitable quality. At a minimum, the primary site² must be equipped with a light microscope, a high-resolution digital camera and/or a video camera, a document camera for gross examinations, and personal computer with image reading software. In addition, a scanner is required when virtual telepathology is planned. At the secondary site², a high-performance workstation and a high-luminance, high-spatial-resolution screen are needed for accurate reading of the transmitted images. Videoconferencing or the telephone is sometimes used at the same time between the two sites to check specimen quality or guide static image acquisition.

As regards transmission standards, the speeds used in the published research vary. On the other hand, there is a consensus that delayed image transmission does not require high bandwidth, unlike real-time transmission, as in the case of dynamic telepathology or the transmission of a virtual slide for an extemporaneous examination. The telepathology literature shows that the Internet is used in different areas of research and that private lines are recommended because they are more secure. Québec has the advantage of the Quebec Health Computing Network (Réseau de télécommunications sociosanitaire, or RTSS) for transmitting clinical administrative data.

The literature consulted is not unanimous with regard to the issue of archiving in static telepathology. There are different practices, and many discussions are underway regarding the legal aspects of all the possible options. As for dynamic telepathology, the American Telemedicine Association (ATA) maintains that it is not necessary to archive dynamic images and real-time images generated during a telepathology session.

For telepathology activities to succeed, the soundness of all the links in the chain—from the purchase proposal to installation and maintenance—must be ensured. Thus, the reliability of the equipment, the interoperability between the different components, and scalability are parameters that need to be considered before any purchase process is undertaken. Other aspects surrounding the purely technical facets are key factors for success. They are the training of all the personnel involved in telepathology: new user-pathologists (imaging training), pathology technicians, surgeons and so on.

Together with training, issues relating to medical accreditation, confidentiality, the payment of fees, and professional liability, as well as other unresolved medicolegal problems continue to hinder the expansion of telepathology. Telemedicine literature considers the remuneration of those involved a key factor for success or failure for telepathology. These issues and the ethical, legal and economic issues regarding telepathology should be examined to facilitate the deployment of this technology.

2. The primary site is the facility that makes the consultation request, while the secondary site is the one that offers the services of an expert at a specialized care centre (secondary or tertiary care centre). We chose to use the term “site” because telecommunications (e.g., Internet site) are involved and the terms “primary” and “secondary” when referring to the type of care (primary or secondary) provided at these facilities.