Telepatology-A New Horizon

Dr. Trupti chordia[1], Dr Anuraag Choudhary[2], Dr Yogesh Rathod[3], Dr Chaitanya Varangaonkar[4], Dr Shailesh Kumbhare[5] r Niraj Deogade [6], Dr. Sharvari Kumbhare[7]

[1]*Department Of Oral Pathology,VSPM's Dental College, Nagpur Maharashtra*
[2]*Department Of Oral Medicine & Radiology, VSPM's Dental College, Nagpur Maharashtra*
[3]*Department Of Conservative Dentistry, Govt. Dental College, Nagpur, Maharashtra India*
[4]*Department Of Dentistry,Dr. Ulhas Patil Medicl College, Jalgaon, Maharashtra India*
[5, 6 &7]Private Dental practitioner's, Nagpur, Maharashtra India
Corresponding Author: Dr. Trupti chordia

Telepathology in India is still in the evolving stages. Although, much progress has been made around the world specially in the field of digital imaging and virtual slides, the practice of telepathology in India still revolves around static telepathology, be it in telelearning or distance learning, or in remote diagnosis. Websites such as telepathology.org.in have been very successful in popularizing telepathology through quizzes of interesting and rare cases. The only study of teleconsultation from India, has shown that a good concordance with glass slide and static telepathology images. The reasons for the relative delay in acceptance of telepathology in India are manifold.
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I.   Introduction

Telepathology is the use of telecommunications technology to facilitate the transfer of imagerich pathology data between remote locations for the purposes of diagnosis, education, research, and external quality assessment.1,2 This technology is useful when there is no on-site pathologist such as in remote regions with limited access to pathology services, for intraoperative diagnoses, teletraining or for obtaining second opinions.3,4

An academic pathologist, Ronald S. Weinstein, M.D., coined the term "telepathology" in 1986. In a medical journal editorial, Weinstein outlined the actions that would be needed to create remote pathology diagnostic services.[3] He and his collaborators published the first scientific paper on robotic telepathology.[4] Weinstein was also granted the first U.S. patents for robotictelepathology systems and telepathology diagnostic networks. Weinstein is known to many as the "father of telepathology". In Norway, Eide and Nordrum implemented the first sustainable clinical telepathology service in 1989;this is still in operation decades later. A number of clinical telepathology services have benefited many thousands of patients in North America,Europe, and Asia.(5,6)

Telepathology systems are divided into three main types: static, dynamic, and virtual slide systems.

Static or delayed-time telepathology

It involves capturing, digitizing, and transmitting still images of a gross or microscopic specimen to a consulting pathologist.4 Static telepathology has the advantages of being reasonably priced and useable in the widest settings, but has the significant drawback of only being able to capture a select subset of microscopic fields.1

Dynamic or real-time telepathology

This transmits and permits viewing of histological images (in realtime) from a remote microscope that the consultant pathologist is able to manipulate from a distance.1,4 Dynamic systems are useful for teaching and research and perform best on local area networks (LANs); however, performance can suffer during periods of high network traffic or if using the Internet for transmission.1,4

Virtual slide systems

It utilize an automated scanner that takes a visual image of the entire slide which can then be forwarded for diagnosis at a remote location.1 Virtual slides reduce sampling errors and permit the production of identical copies, fast transmission, and archiving.4 A disadvantage of both dynamic and virtual slide systems is that the costs may be prohibitive.

Equipment requirements for telepathology generally include a light microscope (or slide scanner), a high resolution digital camera and/or video camera, a document camera for gross examinations, a personal computer with image reading software, and a telecommunications medium at the site making the consultation request.4 A high performance workstation is generally required for the consulting pathologist and factors that should be considered in optimizing the telepathology workstation and digital reading environment are reviewed in the literature.3,5 While these equipment requirements represent an ideal telepathology platform, other means of telecommunication such as use of mobile phones with multimedia messaging services (MMS) capability have been investigated for telepathology.6 ,7

A. USES AND BENEFITS

Telepathology is currently being used for a wide spectrum of clinical applications including diagnosing of frozen section specimens,[7] primary histopathology diagnoses,[8] second opiniondiagnoses,[9] subspecialty pathology expert diagnoses,[10] education,[11] competency assessment,[12] and research. Benefits of telepathology include providing immediate access to off-site pathologists for rapid frozen section diagnoses. Another benefit can be gaining direct access to subspecialty pathologists such as a renal pathologist, a neuropathologist, or adermatopathologist, for immediate consultations13

Other benefits of telepathology:
- Medical professionals in different locations can view images simultaneously and discuss diagnoses through teleconferencing.
- A doctor can consult with a pathologist who specializes in the patient's area of concern, such as liver pathology or lung pathology.
- A healthcare provider can get second opinions more easily.
- Patient data can be synchronized across various electronic health information systems.
- Once implemented, a telepathology system is less expensive to operate than the traditional system.

TELEPATHOLOGY IN INDIA

India was not lagging far behind in the field of telepathology. The first taste of telepathology in India was provided at a symposium organized in the 50th Annual Conference of the Indian Association of Pathologists and Microbiologists in Mumbai in 2001 aptly named Telepathology: Today and Tomorrow.(13)Since then a number of symposia and workshops held in different parts of the country have contributed to popularize this tool both at the national and the state level. A telepathology quiz page was opened in the popular pathoindia.com[14] e-group and interesting cases were put up in the form of a quiz. Some of these cases were also hosted for discussion at http://ipath.ch, which is a free site offering an open source framework for building web- and email-based telemedicine applications.[15] With the experience of pathoindia.com came telepathologyindia.com (now telepathology.org.in).[16] The use of "telepathology quizzes" with images of cases hosted at telepathology.org.in has caught the imagination of pathologists in India, both young and old. These quizzes consist of publication of a brief history of the patient and adequate diagnostic images, and invitation is sent by emails to hundreds of pathologists by the group list at pathoindia.com. Anyone can present a case, and judging from the flurry of replies one gets, this sort of telelearning is indeed very popular. Telepathology.org.in also attempted to give free consultancy service to pathologists in India. However, only about 12 pathologists from around the country and abroad have taken advantage of this service till date.

Desai et al.[17] used static telepathology consultation between a tertiary cancer centre (Tata Memorial Hospital) and a rural cancer hospital (Nargis Dutt Memorial Cancer Hospital) in Barshi, Maharastra was an eye-opener. The authors have proved that using existing telecommunication facilities and a 56 k modem, it was possible to have good telepathology consultation and a concordance rate of 90.2% was observed. The project bore fruit after overcoming initial difficulties of 'unreliable and inconsistent' communications and through perseverance and cooperation amongst various organizations such as Department of Telecommunications (DOT), Mahanagar Telephone Nigam Limited (MTNL), and Bharat Sanchar Nigam Limited (BSNL). The experience gained can serve as a model to make telepathology a working reality in rural India. A possible way to overcome such inconsistencies in network facilities in India, is the use of web-based telepathology systems, as described by Brauchli et al.[15]

In spite of recent Government initiatives to improve the telecommunication facilities, telepathology is yet to permeate into everyday activities for pathologists in India. The reasons for this are manifold. The lack of

agreement on a preferred technology and the lack of uniform standards acceptable to the pathology community have been the major factors responsible for the underdevelopment of telepathology all over the world. One major drawback in rural India is the sub-optimal preparation of slides. Images for remote diagnosis, after all, can only be as good as the original slides. A relative reason for the failure of telepathology consultation and the inability of experts to come to a conclusive diagnosis, apart from sub-optimal images, is the absence of a rapport between the sending pathologist and the consultant pathologist. The latter would rather not give a diagnosis based on images sent by a third party. This was the experience we faced in telepathologyindia.com (now telepathology.org.in). Finally, there has been a resistance from senior histopathologists in India for the promotion of telepathology. This could possibly be because of a negative preconception about telepathology. Reassurance of potential users is necessary because these perceived problems are human, rather than technological.

II. Conclusion

Great technological advances are taking place throughout the world in the field of telepathology. In India, telepathology is yet to take shape. Although, it has been conclusively proved that even with the existing and primitive telecommunication systems, telepathology works, even in rural areas, many factors are responsible for its delayed acceptance in India. Perseverance, cooperation and the willingness to promote telepathology seem to be the order of the day.

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