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Original Article

Indroduction of the telepathology for the intraoperative rapid histopathological diagnosis (IRHD) —Rapid report—

Toshihiko Ikarashi*

The telepathology was introduced in December, 1998, and its availability was discussed for intraoperative rapid histopathological diagnosis (IRHD) in remote hospital without any pathologists. INSnet64 (Nippon Telegraph and Telephone Corporation (NTT)) as Integrated Service Digital Network (ISDN) was the most convenient connection method for the routine telepathology. Phoenix 2000HX set (NTT) could transport moving images or pictures effectively so that the waiting time between provided images in stationary imaging became decreased. The running cost was decreased to ¥120,000 a month. The popularization of this telepathological supporting system may improve the medical quality and decrease medical lawsuits.

Background

The establishment of IRHD was essential to operate patients unrelated to medical environment, e.g., the complete resection should be confirmed with IRHD analysis in the recent damage-reduced operation especially for early carcinoma of breast. IRHD becomes more necessary with both the progress of therapies and the increment of medical lawsuits.

In spite of the clinical necessities of IRHD, there remained the maldistribution and shortage of clinical pathologists, and only 1600 pathologists were registrated in Japan. The remote controlled IRHD supporting system has been examined to substitute for routine IRHD. The establishment of telepathological IRHD depended on the development of multimedia. We had a chance to introduce the most newest telepathology sets between Kouseiren Byouri Center (Nagaoka City, Niigata) as an assisting center and Kariwagun Hospital as a remote hospital (Kashiwazaki City, Niigata), and discussed the usefulness of this system in this paper.

Methods

Transporting system: (1) Providing side: microscope (BH-2, Olympus), Phoenix set (including CCD-adaptor, 3CCD camera, monitor for moving pictures, Poenix 2000HX, voice unit of mutual direction, and remote control, amounting to ¥2,820,000 in all and provided from NTT), (2) Receiving side: Phoenix set (including monitor (Sony) for moving pictures, which could be, furthermore, exchanged for optional BM-1400 or -2000 S monitor (Victor) for the higher resolution of images, Phoenix 2000HX, voice unit, and remote control, amounting to ¥2,200,000 in all), (3) network survice: INSnet64 (NTT) as connection type, consisted of 3 main routes, i.e., 6 telephone lines. INSnet64 as ISDN has just been developed as the most convenient connection for the routine electronic

*Kouseiren Byori Center
Kawasaki2520—1, Nagaoka, Niigata940—0864

transort. Phoenix 2000HX set (NTT), furthermore, could transport moving pictures as well as stationary ones.

Tissue preparation system: (1) tissue specimens were cut by operator in the operating room, (2) these fresh tissue specimen were embedded in the commercial compound and rapidly frozen in 500 ml of closed isopentane in a bottle, reserved in −20℃ freezer, (2) sectioned in the cryostat (Tissue Tek Cryo 2000, Miles, ¥3,600,000), (3) stained for routine Hematoxylin Eosin stain, (4) dehydrating, penetrating, and mounting in a usual manner.

Scanning: Each prepared specimen was scanned with microscope by a image-providing technician or an operator, and its images were transported as moving pictures. At first, each examined material was scanned with the least magnification (x2 objective lens) so that the whole specimen was seen at a glance. Secondarily, every constituent fields of one specimen were microscopically analyzed in detail with higher-power magnification. Changing the analyzing view was ordered to the image-providing technician through voice unit.

Results

Each specimen needed to be analyzed with nine to nineteen transported pictures, and took about three to five minutes a specimen to diagnose. In the histological analyses of stump around the lumpectomy of breast cancer, it took 15 minutes at the lowest estimate because there were at least five minutes. Scanning was chiefly peformed with moving pictures and its movement was repeatedly suspended during intensive analyses. No stationary picture was needed to diagnose. In the indication with voice unit, the conversation was natural between receiving pathologists and providing technicians or operators because of the mutual direction of voice unit.

Conclusions

Competent hospitals for telepathology: Because the rapid section for IRHD was poorly stained than the formalin-fixed and routinely processed ones, the correct diagnosis was more difficult in IRHD. So IRHD should be entrusted to others if there is the large hospital with pathologist in the neighborhood. Competent of telepathological IRHD was the isolated remote hospitals. Niigata would be well indicated in telepathologieal IRHD supporting system because Niigata lies north and south.

System: Network survice consisted of connection type and private line type. The transport velocity of the connection type was slower than that of the private line type, but the introduction of the connection type was cheaper than that of private line type. In routine telepatholgy, an enough information transport was processed with the connection type like INSnet64 (NTT), transporting with the velocity of 384kb/s. In image processing, Phoenix set (NTT) was easy to manage and the transferred microscopic image was sufficient to analyze. So this set was convenient for routine IRHD.

Image-providing side: The main problem in providing pictures was how the specimens were cut out. Because the client's purpose was only satisfied with the accurate cutting of specimens, the operator should cut them off and order the objective side for IRHD analysis in the absence of pathologists.

Image-receiving side: It was important for the analyzers to remember that the transported moving pictures were the worst images to analyze, i.e., the stainability in

IRHD was worse than that of routinely processed permanet sections, and the provided images were, furthermore, more or less inferior to those in the usual direct microscopic analysis. In this situation it was reasonable that the further examination with re-resected specimens was requested if the definitive diagnostic bases could not be confirmed. This careful attitude may be the only method to remove misdiagnosis in the telepathological IRHD.

Key words: telepathology, remote histopathological diagnosis supporting system, intraoperative rapid histopathological diagnosis

原　著

術中迅速診断としてのテレパソロジーの導入

五十嵐　俊　彦*

医療の長足の進歩と医療訴訟の増加した現状において、術中の迅速病理組織診断は、今日の外科学的治療において欠くことのできない検査である。しかしながら、現在、臨床病理診断医が常勤する診療施設は少ないのが実状である。マスメディアの発達により、次善の策としての画像伝送による遠隔病理診断支援システムが臨床応用されてきた。今回、われわれは、新潟県厚生連とＮＴＴ新潟の協力により、新潟県長岡市の厚生連病理センターと新潟県柏崎市の厚生連刈羽郡病院臨床検査室にそれぞれPhoenix 2000HXセットを設置し、また、電話回線であるINSネット64で結ぶことにより（コネクション型ネットワークサービス）、従来の出張迅速病理組織診断の代用が可能であることを確認した。毎月のランニングコストは約12万円であった。今後、複数の系統治療施設と有機的に連結することにより、より地域医療の発展に貢献できる可能性が示唆された。

キーワード：術中迅速診断、テレパソロジー、遠隔病理診断支援システム

*〒940－0864 新潟県長岡市川崎１丁目2520番地１
厚生連病理センター