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Statistic Report

Reevaluation of telepathology system in the Niigata-ken Koseiren at a turning point of the fifth year after the establishment (the second report)

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Background: As previously reported, the supporting system for a remote intraoperative rapid histopathological diagnosis by frozen sections (abbreviated to Telepathology) has been established in the Health and Welfare Association of Niigata-prefectural Agricultrural Co-operative Society (the Niigata-ken Koseiren); e.g. between Pathology Center in Nagaoka City as a receiver and diagnostician side and Kariwagun General Hospital in Kashiwazaki City as a transmitter and surgeon side since October, 1998 and, furthermore, Murakami General Hospital in Murakami City as a transmitter and surgeon side since October, 2001. In this study, our telepathological system was evaluated on its utility. Statistics: The number of telepathological cases ordered from Kariwagun General Hospital increased from 2.1 cases a month to 11.1 cases a month, which was statistically significant ($p<0.05$, correlation coefficient during 16 months after introduction of telepathology $=0.83$). In Niigata Prefecture, the number of intraoeprative rapid histopathological diagnosis (Frozen sections) was in proportion to that of permanent histopathology (correlation coefficient $=0.79$, [expected numbers of frozen sections a month] $=0.026$ x [numbers of permanent pathology a month] $+0.026$). The requested numbers of telepathological cases from above two hospitals became within a statistically expected normal limit. The purposes of requests for telepathology from above two hospitals were as follows: 70% of cases were examined for an assessment of metastasis, 25% for a reconfirmation of malignancy, and 5% for an assessment whether the excised margin of a specimen was involved by tumor or not. As to devices of telepathology, we used the animation-type image transmission with bi-directional mike and speaker (Telepathology based on the Television conference system produced by Nippon Telegraph and Telephone Corporation (NTT)), which was more convenient than other photograph-typed image transmission systems. Furtherm

Key Words: telepathology, telemedicine, supporting system for remote histopathological diagnosis, Television Conference System (Nippon Telegraph and Telephone Corporation, NTT), intraoperative rapid histopathological diagnosis, frozen sections, the Niigata-ken Koseiren

Background

There were fewer pathologists in Japan, especially in the provinces; there were 3.4 doctors per hospital in the United States, 0.4 in Tokyo of the metropolitan area, 0.17 in Niigata Prefecture of the country, and 0.14 in Tohoku Prefecture of the country. Furthermore, in Niigata Prefecture, an uneven distribution of pathologists among hospitals was pointed out and was the lowest in the Niigata-ken Koseiren (Table 1)(1). To make matters worse, hospitals of the Niigata-ken Koseiren were spread all over Niigata Prefecture: e.g. Kariwagun General Hospital, where a telepathology was firstly established, was 25km away from our laboratory in a straight line and it took 50 minutes by car, and Murakami General Hospital, where a telepathology was secondarily established, was 105km away and it took 2 hours and 30 minutes by car. It was impossible for these hospitals to perform intraoperative frozen sections without pathologists because of being too far from our Pathology Center to perform an intraoeprative diagnosis. Regardless of their remote residences, however, not a few patients requested modern medicine equal to those reported on newspaper or television. On the other hand, with the advance of intelligent technology (IT), telemedicine could partially satisfy their requirements. Telemedicine was of wide use as followings: teleradiology for 45% of cases, at-home care for 17%, and telepathology for 12%(1). Furthermore, as to telepathology, the Japanese Telepathology Study Meeting was established to assist doctors in performing safer operations on August 25th, 2001.

Telepathological devices were classified into two main types on the base of image transmission: (1) animation-type (produced by NTT) and (2) photograph-type or motionless type (produced by Olympus company and Nikon company). The former was cheaper and more rapid to transmit a picture than the latter. But the latter rendered

sharper picture rather than the former. In our telepathological system Television Conference System (NTT) was used as an animation-type image transmission system. Five years having passed after an establishment of this system, we made a re-assessment of this system in the Niigata-ken Kouseiren group in this study.

Statistics

The number of telepathological cases increased year after year (Fig. 1). In Kariwagun General Hospital the telepathological requests increased from 2.1 of cases a month to 11.1 a month, before and after an introduction of telepathology, respectively. Furthermore, its increment was statistically significant ($p<0.05$, correlation coefficient during 16 months after introduction $=0.83$) (Fig. 2). In Niigata Prefecture, the number of frozen sections had a tendency to increase in proportion to that of permanent histopathology (correlation coefficient $=0.79$, [expected numbers of frozen sections a month] $=0.026$ x [numbers of permanent pathology a month] $+0.026$) (Table 2 and Fig. 2). The requested telepathological cases from above two hospitals increased and reached to expected ones.

Telepathological system had mainly three uses: assessing disease progression for 70% of cases, reconfirming malignancy for 25%, and considering whether a resection stump was involved in tumor or not for 5%.

In an operation of system devices, our animation-type image transmission system took less time to reach a histological diagnosis than that by other photograph-type instruments, 5' to15-30', respectively.

Discussion

Our telepathological system has played a sufficient role because we have preserved a telepathology system with Kariwagun General Hospital for 5 years with the growing demand and, furthermore, a telepathology has been introduced into Murakami General Hospital (1-3). The frequency of telepathological uses increased to an expected number agreed with each hospital scale, which indicated that the significance of telepathology had spread over surgeons. Operators used telepathology at operation mainly for an assessment of disease progression such as whether lymph nodes and other structures were involved by neoplasm and whether the excisional magins of a specimen were free from cancer, so that further surgery should be performed if necessary. There were also a few cases which had no definite diagnosis preoperatively, in which it was very useful to diagnose their tumors as malignant or benign by telepathology during operation.

The animation-type image transmission system of our adoption was more convenient than other motionless photograph-type one. On the other hand, there remained a poor quality of pictures and a slow transmitting velocity on image transmission in telepathology, which required a modest attitude not to make a misjudgement in a diagnostic process ub pathologists: i.e. we should not make a diagnosis irresponsibly without any well-grounded confidence(1). In these situations it was important for pathologists to say operating doctors clearly, "We cannot diagnose because ・・・・" or "We can affirm to this point but cannot assert regarding other points. Final diagnosis should be rendered to permanent sections."

A progress of IT will make a telemedical service more convenient for us and come into wide use. It follows that any patient can receive modern medicine equal to those reported on newspaper or television regardless of their handicaps of remote residences.

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新潟県厚生連病院における術中迅速病理組織の画像伝送による遠隔病理診断支援システム（テレパソロジー）導入後の５年間の統計（第２報）

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背景：凍結切片を使った術中迅速病理組織の画像伝送による遠隔病理診断支援システム（テレパソロジー）は、1998年に受信・診断側の新潟県厚生連病理センター（長岡市）と送信・術者側の新潟県厚生連刈羽郡総合病院(柏崎市)の間に、また、2001年に送信・受信者側の新潟県厚生連村上総合病院（村上市）との間に設置された。今回、テレパソロジーの利用状況とその操作性について、導入５年後の節目に際して、再検討がなされた。

統計内容：テレパソロジー依頼症例数は、刈羽郡総合病院において、１ヶ月あたり2.1症例から11.1症例までに増加し、その増加率は統計的に有意であった($p<0.05$、導入直後の16か月間における相関係数$=0.83$)。新潟県内の病院においては、迅速病理診断件数は通常の永久標本件数に比例する（相関係数$=0.79$、[月当りの予測迅速診断件数]$=0.026$ x [月

当りの永久病理診断件数］＋0.026)。この式に基づくと、テレパソロジー導入後の２病院からのテレパソロジー依頼件数は、病院規模に相当するものであった。また､テレパソロジー依頼目的に関しては､症例の70％が臨床病期確定の為の転移の確認に、25％が悪性の確定に、５％が切除断端部分における腫瘍の取り残しの評価であった。装置に関しては、従来の静止画像送信装置に比較して、双方向性マイク・スピーカー付き動画像送信装置（NTT 製テレビ会議システムを基本とする遠隔病理診断支援システム）が利便性に優れており、診断に要する時間は15～30分対５分と著明に短縮できた。

結論：テレパソロジー希望の症例数は年々増加し、その増加度はシステム導入前後の比較において統計的に有意であった。テレパソロジー導入後の２病院からのテレパソロジーによる迅速病理診断依頼件数がそれぞれの病院規模相応であったことより、病理医の常勤していない施設の外科医にとって、テレパソロジーは信頼に値する手段となり、手術に不可欠のものとなりつつあると判断された。依頼症例の25％においては術前に悪性の診断がつかないままの手術となったものであり、このような症例においては、術中迅速病理診断は不可欠と考えられた。テレパソロジー装置については、NTT 製テレビ会議システムを基盤とする遠隔病理診断支援システムが､他装置に比較して､便利であった。

キーワード：テレパソロジー、遠隔医療、テレメディシン、遠隔病理診断支援システム、テレビ会議システム（NTT)、術中迅速病理組織診断、新潟県厚生連

Table 1． Arrangement of Pathologists and the scales of their hospitals in Niigata Prefecture in 1999.

hospitals			frozen sections	Pathologists	
calssification	total number	total sick beds	total number/year	total number	density of members/ hospital
National	10	3125	498	11	1.1
Prefectural	16	4154	572	7	0.4
Civil	12	2171	167	3	0.3
Red Cross	1	748	321	3	2.6
Koseiren	14	3446	240	2	0.1
Saiseikai	3	773	22	2	0.5
Ocupational Health & Medical	2	685	78	2	0.8
Others	80	15235			
total	138	30338	1898	72	0.5

in the year 1999.

Table 2． Changes of frozen sections number before and after introduction of telepathology with several controls for comparison in Niigata Prefecture（referring Fig.2)．

subjects	General Hospital	numbers of histopathology / month (2000)	mean numbers of frozen sections/month			significance
			(2000)	before introduction of telepathology	after introduction of telepathologcy	
Object of study**	Koseiren Kariwagun	272	14.9	2.1	11.1	p＜0.05, correlation coefficient＝0.83＊
	Koseiren Murakami	124	0	0	2.4	
Control of study***	Koseiren Nagaoka Central	376	4.8	6 &		
	Niigata Prefectural Cancer Center	963	18.7			
	Niigata Prefectural Central	600	19.7			
	Niigata Prefectural Shibata	287	9.3			
	Niigata Civil	494	13.9			
	Nagaoka Red Cross	716	26.8			
	Saiseikai Niigata 2 nd	343	8.5			
	Tachikawa	329	5.6			

＊: during first 16 months after introduction of telepathology

＊＊: groups with introduction of telepathology

＊＊＊: groups without introduction of telepathology

＆：５－year average from 1998 to 2003

in the year 2000

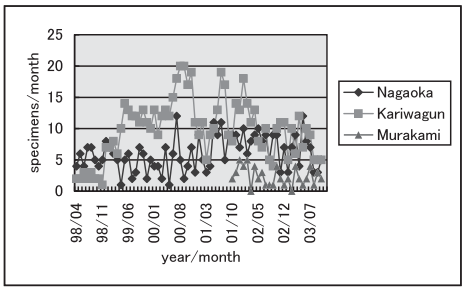
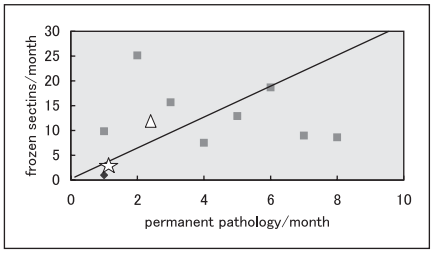


Fig 1．Change of specimens a month in each institute from 1998 to 2003.



◆ control hospitals, ■ expected numbers
△ Kariwagun General Hospital, ☆ Murakami General Hospital

Fig 2．Change of specimens in Kariwagun General Hospital after an introduction of telepathology system. Correlation between total numbers of histopathology a month and those of frozen sections a month（referring Table 2）.