Second Opinion Telepathology on Frozen Sections based on a ATM-Network

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Telepathology - what it is

- ✓ Teleconversation
- ✓ Teleconsultation
- ✓ Telediagnosis
- ✓ Frozen section expertise
- ✓ Frozen section diagnosis

The object of telepathology is not the histological image, but the

CASE

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Pathological Case

- Patient data
- Blocks, slides
- Macroscopy
- Microscopy
- Laboratory data
- Technical information
- Clinical information
- Previous diagnoses ...

Telepathological Case

- Pathological case
- Images with several properties, coordinates, annotations,
- Overview images
- Sender and receiver of cases
- Mails with complex Content
- Videoconferences

Videoconferencing and Telepathology

- Is it possible to use a commercial videoconferencing system for telepathology?
- Which tasks within a telepathology system may be handled using a commercial videoconferencing system?

Classification of Telepathology Systems

Class	Imaging System	Image Aquisition	Video-conference
1	Static	Referral	No
2	Static	Host	No
3	Dynamic	Referral	Yes
4	Dynamic	Host	Yes
5	Dynamic/ static	Host	Yes

Transfer time of a 512x512x3x8-bit image

Connection type	Transfer rate per second	Transfer time (seconds)
ISDN	64 kb	95 s
n*ISDN	n*64 kb	95/n
Ethernet	10 Mb	0,6 s
FDDI	100 Mb	0,06
ATM	144 Mb	0,04

Transfer quality

Connection type	Transfer quality	Product
ISDN	Constant rate	Intel Proshare
n*ISDN	Constant rate *f(n)	IAT MKFS
Ethernet	Net traffic dependent	Intel Proshare
FDDI	Net traffic dependent, separate rings possible	SysConnect Star
ATM	Constant rate on demand	Cellware cellstack

Technical Demands

	Documen-tation	Audio-Communikation	Makros-copy	Audio-Comm. with Surgeon	Robotic Microscope	Requir. On Comm. Channel
Conversation (offline)	-	(+)	-	-	(+)	low
Consultation (offline)	+	(+)	-	-	(+)	low
Diagnose (offline)	+	(+)	-	-	(+)	low
SS-Expertise	+	+	-	-	(+)	high
SS-Diagnose	+	-	+	+	+	high

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Direct application of videoconferencing

Connection type	Tele-Conversation	Tele-Consultation	Tele-Diagnosis	Frozen Section Expertise	Frozen Section Diagnosis
ISDN	Yes	No	No	No	No
n*ISDN	Yes	Yes	No	(Yes)	No
Ethernet	Yes	(Yes)	No	No	No
FDDI	Yes	Yes	No	Yes	No
ATM	Yes	Yes	No	Yes	No

Type of TP-Communikation

	On line (live)	Off line (mail)
Conversation	Yes	Yes
Consultation	Yes	Yes
Diagnostic	Yes	Yes
FS-Expertise	Yes	No
FS-Diagnostic	Yes	No

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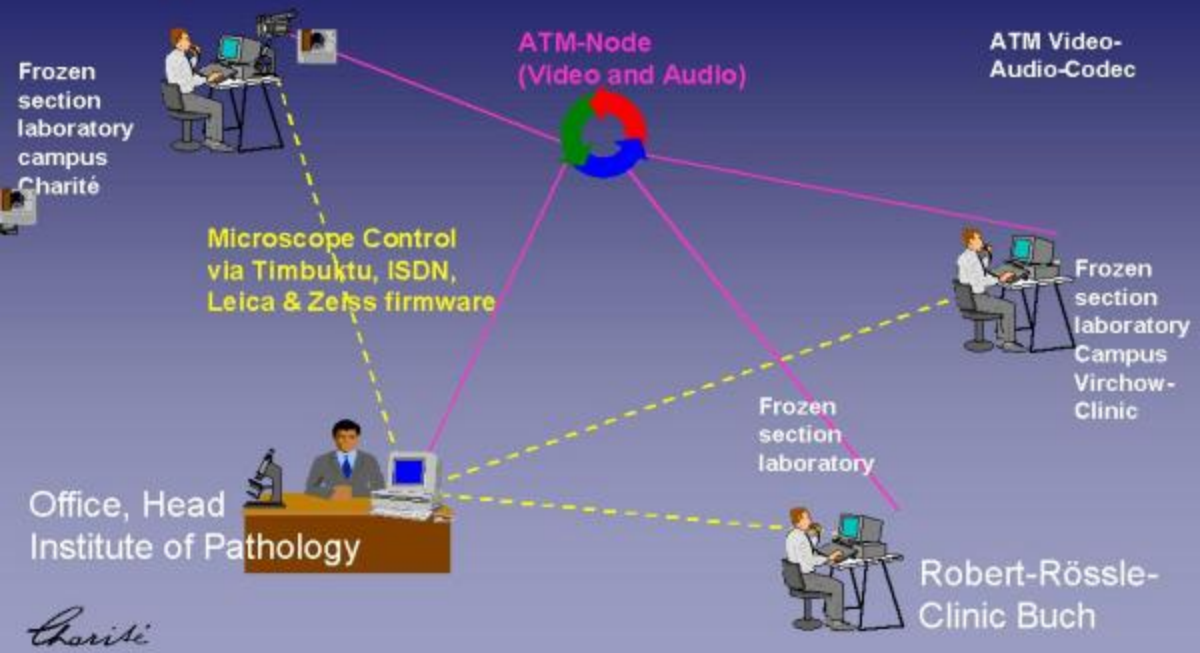
Clinic for Surgery and Surgical Oncology
Campus
Berlin-Buch
Institute of Pathology
Campus
Virchow-Klinikum
Frozen Section Laboratory
Institute of Pathologiy
Campus
Mitte
Telepathology via ATM-Network
at Charité Berlin

Telepathology via ATM



Technical Elements of the ATM Network

- RXA, Leica Microsystems, controlled by firmware via RS-232
- Axioskop, Carl Zeiss Jena, controlled by firmware via RS-232
- 3CCD video camera, DXC-930p, Sony Corp.
- ATM-Video-Audio-Codecs, bi-directional, Cellware Broadband GmbH
- Remote microscope control via Timbuktu application sharing, Farallon Communications Inc.
- ATM-network, 155 Mbit/s
- Audio- and video switching in OP, to contact physician

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Telepathology via ATM

- Image Size : 768 x 625 Pixel
- Direct Video and Audio Contact to Pathologist and to Surgeons in different Rooms
- Remote Microscope Control

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FS-Expertise, Workflow

- Put the slide under the microscope
- Contact the partner via Videoconference
- Description of case and demonstration of histological features
- Discussion of the most significant areas
- Fix the Diagnosis

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Frozen Section Expertise in Daily Routine

- 423 cases during 2 months
- 20-30 frozen sections per day
- Time, necessary for a second opinion ranged between 0 and 5 seconds
- Quality of images transferred real time was found sufficient in more than 95%
- Time necessary for a sufficient second opinion ranged between 1 and 10 minutes
- Detection of atypical mitosis is a problem

Frozen Section Diagnosis in Daily Routine

- 85 frozen sections in 14 days
- Number of frozen sections per case ranged between 1 and 5
- Quality of images transferred real time was found sufficient in more than 95%
- Time necessary for a sufficient second opinion ranged between 5 and 20 minutes
- Direct video and audio contact to the surgeon
- Problem to distinguish between inflammations and possible recurrence of a breast carcinoma

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Conclusions

- Frozen section expertise is possible using dynamic imaging based on ATM
- Frozen section diagnosis is possible using dynamic-robotic imaging based on ATM, direct contact to the surgeon is necessary
- Conventional videoconferencing based on ATM may be used for second opinion in frozen sections

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Advantages of Telepathology

- ✓ Second Opinion simple and fast,
  higher safety for patient + physician
  → shorter treatment time
  →
- ✓ Attainable independent of geographical distance
- ✓ Education en passant
- ✓ Possibility to serve hospitals without Pathologist
- ✓ Implicite application of quality standards
- ✓ Saving time and money

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Suppositions for Routine Telepathology

Quality of Technical Solution

Second Opinion culture

Economic Aspect

Optimal Integration to Pathologists Workflow

Requirements to Manufacturers, Pathologists, Sc. Societies

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