

TELECOMMUNICATING RADIATION ONCOLOGY : A MULTISITE LINEAR ACCELERATORS IMPLANTATION AS A POSSIBLE MODEL FOR DEVELOPING COUNTRIES ?

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Background: In curative cancer treatment, radiation therapy represents a major tool either exclusively or associated with surgery. While greatly improving the potential for a positive outcome, technological advances bring an increasing complexity at a cost sometimes unaffordable for organizations or governments.

Purpose: Customizing radiation therapy not only to the needs but also to the finances is a solution which would help in view of a better treatment availability among cancer patients.

Materials and Methods: An innovative technical platform was implemented in the form of a central radiation therapy location linked to three satellite remote treatment sites through an optic fiber network. The main unit constitutes a comprehensive center with all facilities: simulators, treatment planning systems, low to high energy teletherapy machines. Special techniques (stereotactic, intensity modulation, total body irradiation) and all types of brachytherapy are centralized. A Primus® linear accelerator with full functionalities operates at each remote unit. In spite of distances up to 100 kilometers between sites of activity, the department works in complete interactivity with real time transmission of data and images. The entire workflow is managed by Lantis® Siemens through an integrated single database and a network representing the world largest installed architecture of the system.

Results: The multisite radiation oncology center allows easy accessibility for cancer patients of a wide geographic area. The hierarchical implantation among the different sites ensures optimal use of expensive equipment. Unnecessary duplications are avoided while advanced therapeutic technologies can enter in routine clinical practice. Coordination of all oncological activities boost their quality level. Caregivers constitute an homogeneous team even if part of their relationships belong to virtuality. Treatment guidelines, technical protocols, evaluation and follow-up activities are fully integrated. Clinical trials are conducted in common.

Conclusion: A multisite linear accelerators implantation linked through an Internet network could represent a valuable model for developing countries. With telecommunicating radiation oncology, the dilemma between high quality of care for most cancer patients and limited financial resources might find the beginning of a solution.

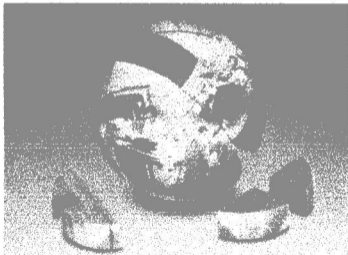
TELECOMMUNICATING RADIATION ONCOLOGY

**A MULTISITE LINEAR ACCELERATORS
IMPLANTATION AS A POSSIBLE MODEL
FOR DEVELOPING COUNTRIES**

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RADIATION THERAPY IN CURATIVE CANCER TREATMENT



**participation to
50 % of cures :**

<> exclusively

**<> association
with**

- surgery**
- chemotherapy**

Global and continuous care
WHO recommendation
Radiation oncologists
Oncology nurses
Social-administrative workers
Patient chart & registration

Patient and family information

Help and psychological support
associations
volunteers

External radiotherapy
- exclusive
- pre- or post- operative
- chemotherapy associated

Simulation
Radiation oncologists
Radiation therapists

Management of acute effects
+ *general practitioner*
+ *organ specialist physician*

Treatment planning
Radiophysicists, dosimetrists

Supportive measures
nutrition, infection, anemia, pain...

Irradiation sessions
Radiation therapists

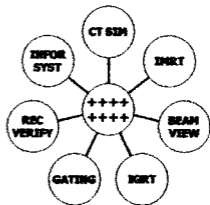
Quality control

IMPROVING THE POTENTIAL FOR A POSITIVE OUTCOME IN EXTERNAL RADIATION THERAPY

Flow chart
optimization

Technological advances
integration

>>> INCREASING
COMPLEXITY



- availability of **competences**
- affordability of **costs**

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**FOR MOST CANCER PATIENTS
IN THE WORLD...**

- high quality of care
- geographical and economical accessibility

are often compromised

>>> customizing radiation therapy
to health needs of populations
to financial resources of communities

MULTISITE LINACS IMPLANTATION

STARTING :

University Hospital
Comprehensive
Radiation Oncology
Department

PATIENTS BASED ACTIVITIES

- ◇ e-chart
- ◇ cancer registry

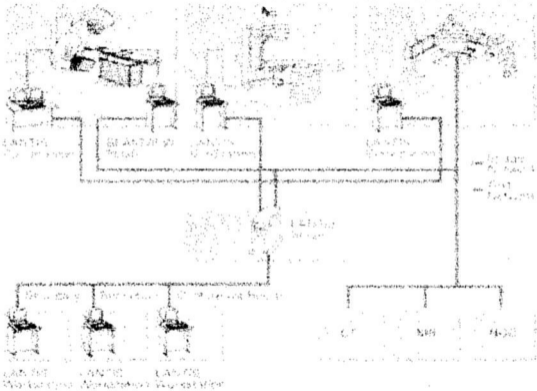
TREATMENT RELATED FUNCTIONALITIES

- ◇ simulation
- ◇ treatment planning / dosimetry
- ◇ all irradiation techniques

10.10.10.10

10.10.10.10

10.10.10.10



LAN 101
Workstations

LAN 102
Workstations

LAN 103
Workstations

LAN 104
Workstations

Server
S1, S2, S3

Server S1, Server S2, Server S3

LAN 101
Workstations

LAN 102
Workstations

LAN 103
Workstations

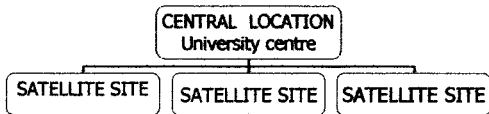
S1

S2

S3

MULTISITE LINACS IMPLANTATION

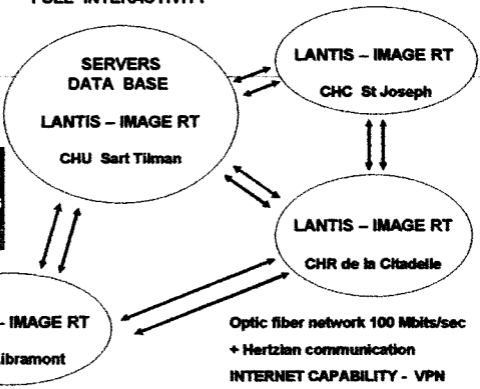
EXPANDING :



At each remote location :

- a general hospital
- a Primus® Siemens linear accelerator
- full capabilities in external irradiation

**REAL TIME TRANSMISSION OF DATA AND IMAGES
FULL INTERACTIVITY**



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Telecommunicating avoids unnecessary multiplication of expensive equipment

CENTRAL**SATELLITE****SIMULATION**

+	CT imaging	+
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+	virtual procedure	0
---	-------------------	---

+	<u>DOSIMETRY</u>	0
---	-------------------------	---

+	<u>PLANNING SYSTEMS</u>	0
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QUALITY ASSURANCE

+	on site monitoring	+
---	--------------------	---

+	telemaintenance	0
---	-----------------	---

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Telecommunicating avoids unnecessary multiplication of expensive equipment ...

CENTRAL**SATELLITE****TREATMENT**

+ scheduling +

+ irradiation delivery +

+ **BILLING** 0

ADMINISTRATION

+ local +

+ general 0

... while advanced technologies and methods enter in routine practice

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Telecommunicating ensures optimal functions of available professionals

CENTRAL

SATELLITE

+

e-charting

+

+

cancer registration

+

+

treatment guidelines

+

+

cases reports and discussions

+

+

outcome evaluation

+

+

follow-up

+

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Telecommunicating ensures optimal functions of available professionals ...

CENTRAL

SATELLITE

+	research & development	+
+	clinical trials	+
+	continuing education	+

... while caregivers, despite of virtuality, constitute a homogeneous team and have their scientific activities boosted by confrontation as well as integration

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Telecommunicating can help to generalize patient oriented activities...

CENTRAL

SATELLITE

+	information circulation	+
+	educational programmes	+
+	supportive measures	+
+	self-help groups	+

... while geographical accessibility is made possible

Telecommunicating might bring the beginning of a solution to the dilemma between high quality of care for most cancer patients and limited financial resources.

In radiation oncology, a multisite hierarchical implantation of linear accelerators linked through an Internet network could represent a valuable model for specific developing countries.