

RADIOTHERAPY

HISTORICAL BACKGROUND

- 1895 - Discovery of x-rays by Roentgen
- 1898 - Discovery of radium by the Curies
- 1899 - First patient cured by radiation therapy was reported
- 1910 - Use of brachytherapy with radium needles and tubes
- 1922 - Clinical radiation therapy as a medical discipline began at the International Congress of Oncology in Paris
- 1934 - Coutard developed a protracted, fractionated scheme that remain the basis of current radiation therapy practice
- 1936 - Paterson published results in the treatment of cancer with x-rays

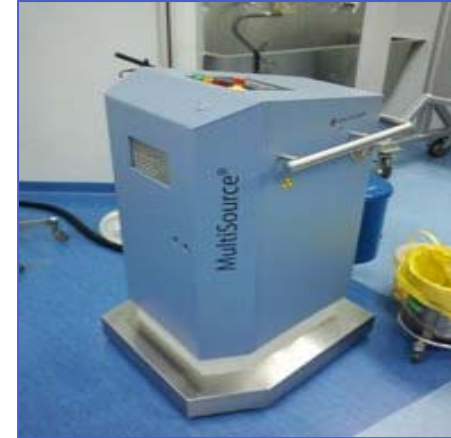
HISTORY OF RADIOTHERAPY AT UMMC

1997: The clinical oncology unit was established with state of the art equipment including linear accelerator with multileaf collimators, stereotactic radiotherapy, High Dose Rate and Low Dose Rate remote afterloading brachytherapy, and virtual simulation.

RADIOTHERAPY MODALITY



CT SIMULATION & CONTROL CONSOLE



BRACHYTHERAPY (BEBIG)



**CONVENTIONAL SIMULATION
& CONTROL CONSOLE**



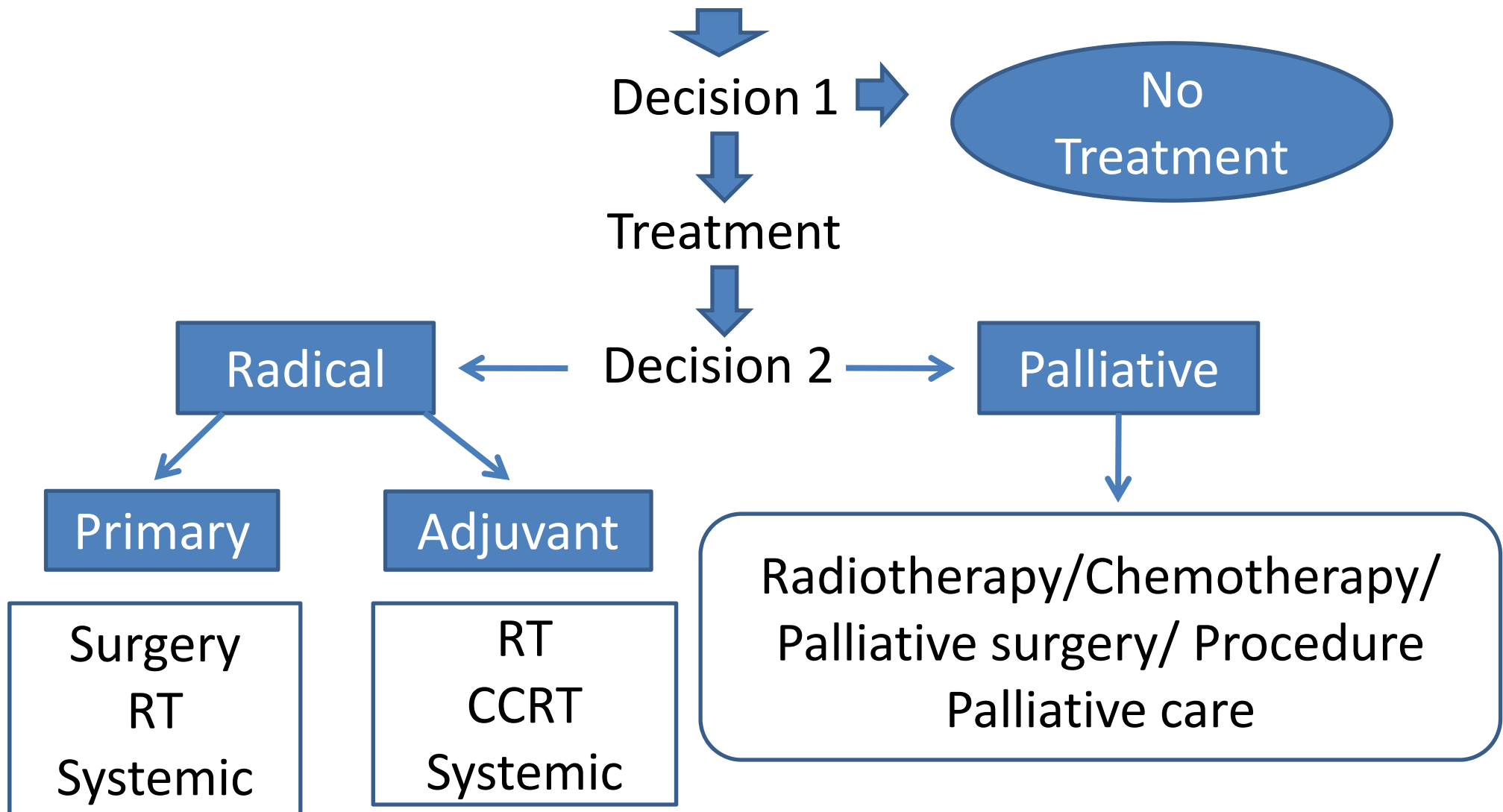
**SINGLE ENERGY
LINAC**



**DUAL ENERGY
LINAC**

TREATMENT ALGORITHM

Diagnosis of cancer, Staging and Histology reviewed



WHAT IS RADIOTHERAPY (RT)?

- It is commonly used as treatment modality for cancer therapy. There is two intention of RT:
 - Cure (curative intention)
 - Reduce pain and suffering (palliative intention)
- It uses a high-energy radiation with the aim to deliver a precise determined radiation dose to an accurately defined tumor volume while simultaneously minimizing the radiation dose to the surrounding healthy organs.
- Radiation therapy is routinely used independently or in combination with surgery or chemotherapy.

TECHNICAL METHODS OF DELIVERY

1) External Beam Radiotherapy Treatment (EBRT)

Radiation source is at a certain distance from the tumor/target area delivered through a Linear Accelerator (LINAC) machine.



PATIENT SET-UP



TREATMENT DELIVERY

TREATMENT GOALS

Radical

- Potentially curative therapy, given with the intent of long term control or cure for the patient

Palliative

- Aim is NOT for cure
- To prolong life and alleviate suffering
- To improve the quality of life for a patient with no implied impact upon their survival

EBRT FLOW CHART

Patient registration



Chemotherapy ← Decision making during 1st visit

External Beam Radiotherapy

**Conventional
Simulation**
Acuity (VARIAN)

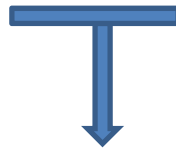
CT-Simulation
Big-Bore CT
(PHILIPS)



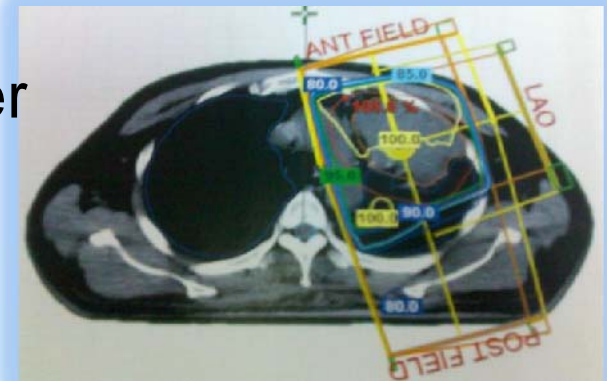
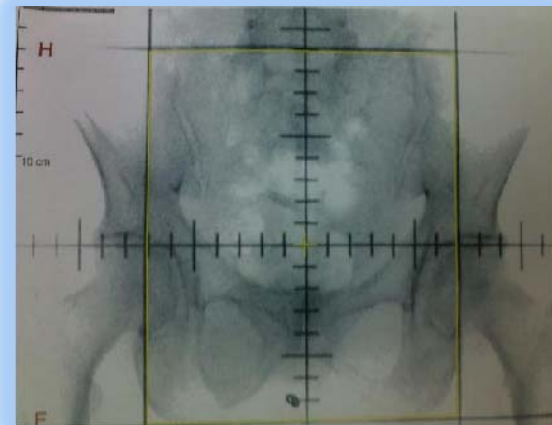
2D
planning



3D Computer
planning



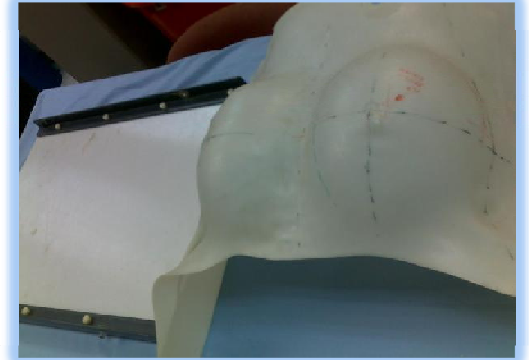
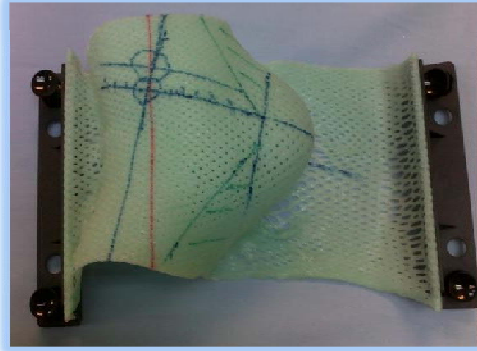
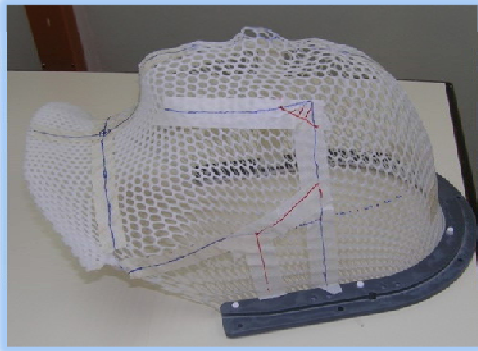
Radiotherapy treatment



WHAT IS RT SIMULATION?

- Before begin external beam radiation treatment, radiation therapy team carefully plans the treatment in a process called radiation simulation. Radiation therapy treatment planning usually involves body positioning making marks on your skin and taking imaging scans.
- A variety of immobilizers may be used to ensure you'll be in the same position for each radiation therapy treatment. A cushion-like device called a Vac-Lok bag — similar to a beanbag with the air removed — holds its shape, cradling you in the best position.

IMMOBILIZATION DEVICES



DIFFERENT TYPE OF THERMOPLASTIC DEVICE



VAC-LOK



FRAME

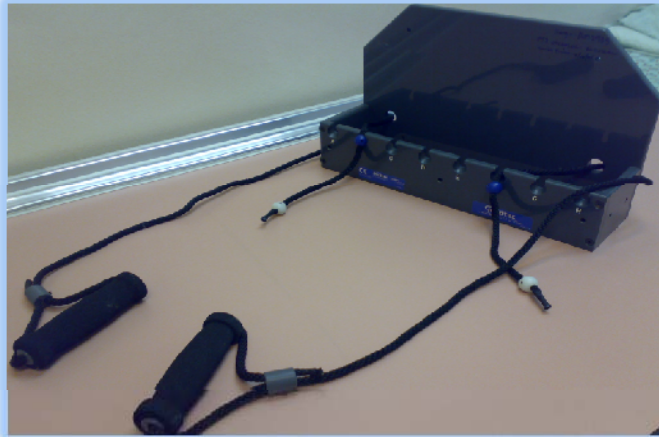


WAX BUILD-UP

TREATMENT ACCESSORIES



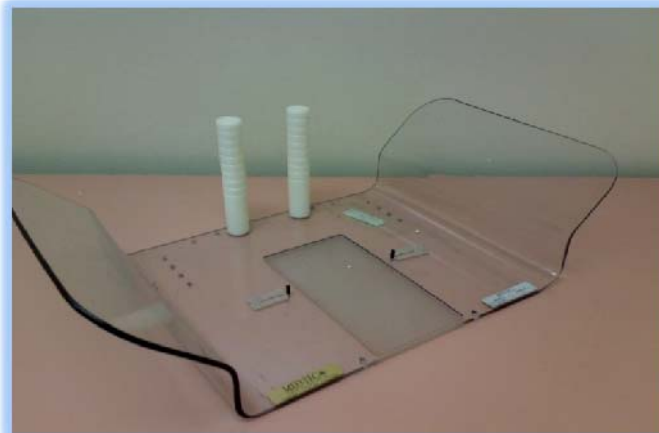
MAX 3- Used in breast treatment (can be adjusted depend on patient comfortable or treatment required)



SHOULDER RETRACTOR – To pull down shoulder for head and neck cases



LUNG CHAIR- patient couldn't lie down because blocking of respiratory area.



WINGBOARD- Patient position for chest area

TREATMENT ACCESSORIES



BELLYBOARD – Prone position for patient that has big tummy



PRONE HEADREST -
Treatment on posterior part head and neck area



PRONE PILLOW –
Normally for rectum area

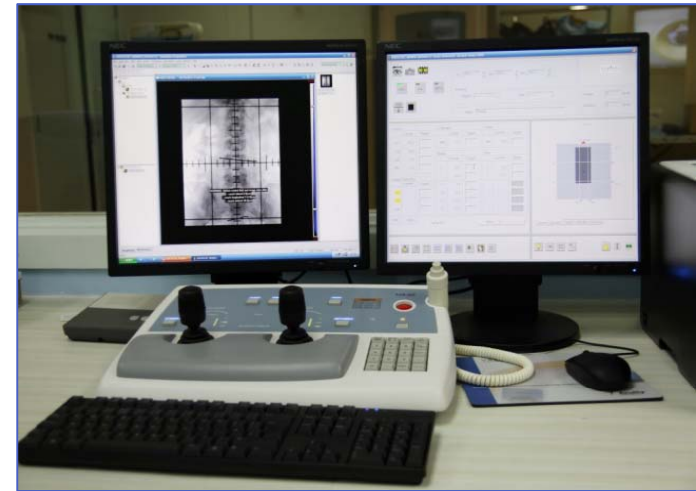


HEAD SUPPORT- in different size depend on treatment required and patient comfortable

SIMULATOR

CONVENTIONAL SIMULATION

- The simulator is exactly as its name implies; it "simulates" your treatment so the physician and staff can customize the treatment setup to your particular needs.
- A simulator comes in different forms, a conventional simulator or a CT simulator.



CONVENTIONAL SIMULATOR AND CONTROL CONSOLE

SIMULATOR

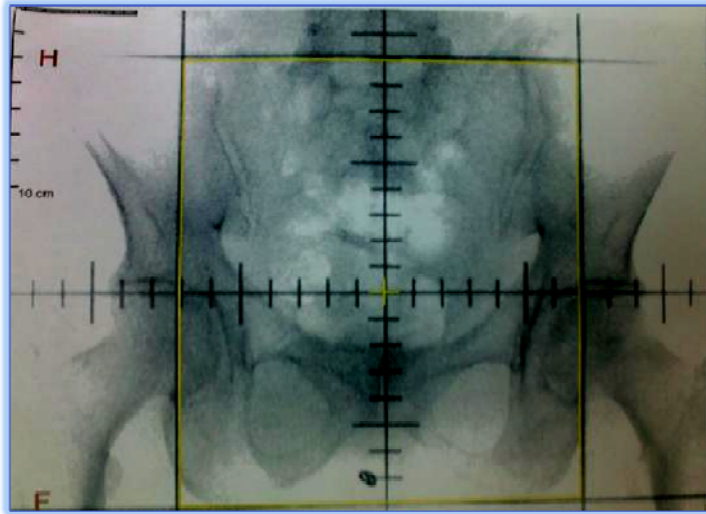
VIRTUAL SIMULATION (CT SIMULATION)

- The conventional simulation process is very time consuming. In principles one has to find coordinates that have been determined using the treatment planning system. The virtual simulation process replaces the conventional simulation with software equivalents to the conventional simulation process.

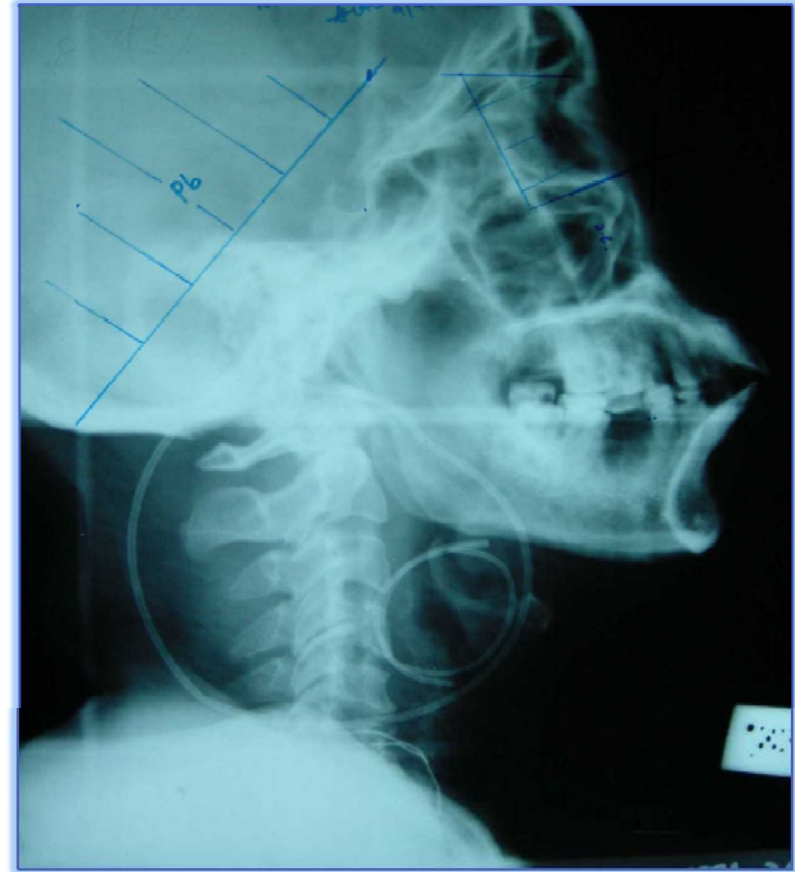


BRILLIANCE BIG-BORE CT

SIMULATOR IMAGE

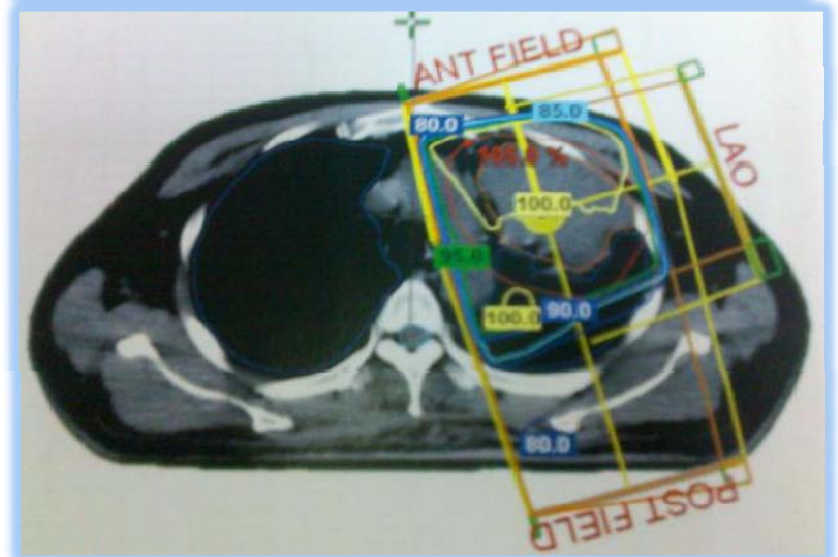
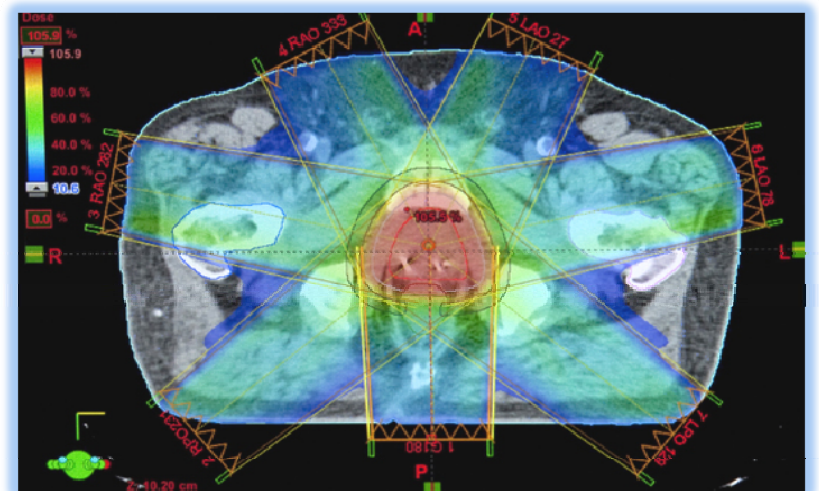
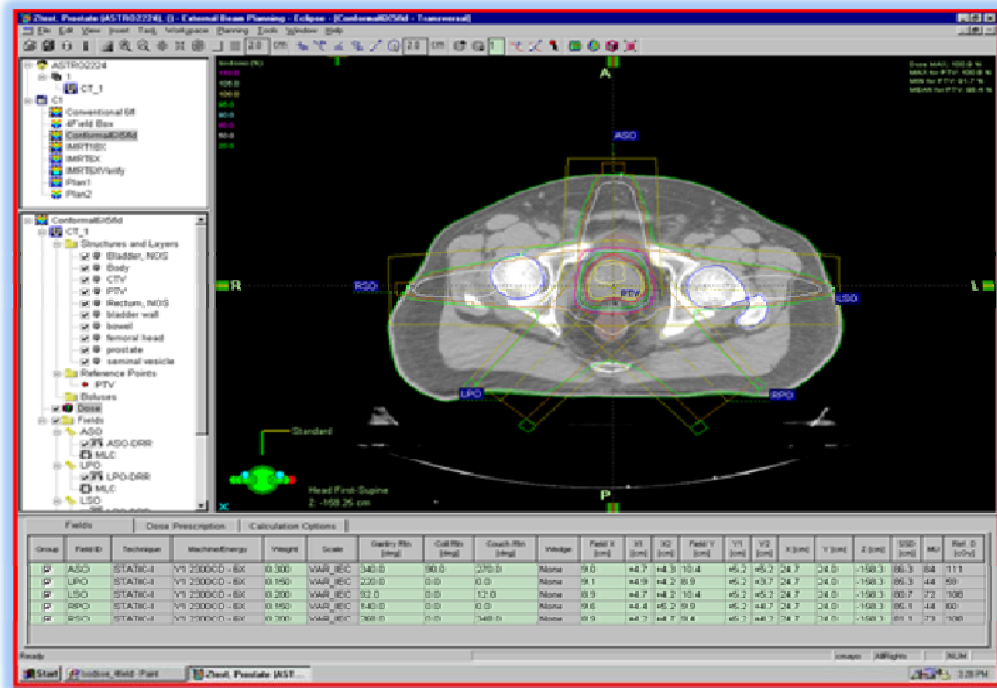


PRINTED
CONVENTIONAL
SIMULATION IMAGE
AND FILM- AREA OF
TREATMENT



COMPUTER PLANNING

- To deliver accurate dose inside treatment area



**RADIOTHERAPY COMPUTER
PLANNING IMAGE AND IMAGE
PRINTED**

EBRT TREATMENT

- The course of radiation therapy treatment usually consists of 5 days of treatment per week.
- The duration of treatment depends on the area being treated and the dose prescribed by oncologist.
- It may vary from 1 – 7 weeks. Treatment is painless and usually takes about 15 – 30 minutes from set-up to completion.

EBRT TREATMENT

- Patients can breathe and swallow as normal but must keep as still as possible with the minimal movement throughout the treatment
- The Radiation Therapist will be observing patient's treatment via CCTV from the control area.
- During the course of treatment, oncologist will review your treatment progress.
- Prior to your treatment, the radiation therapist will deliver proper treatment explanations and advices on treatment care.

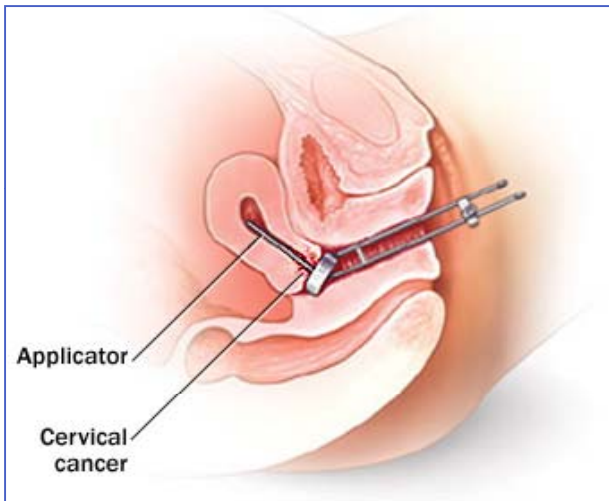
TECHNICAL METHODS OF DELIVERY

2) Brachytherapy

- Radioactive sources (sealed) are placed in direct contact with or close/adjacent to the tumour /target area.
- It used to treat gynecological cases as well as head and neck.
- Our machine (Bebig) used radioactive source, called Cobalt-60 in brachytherapy treatment.

BRACHYTHERAPY FLOW CHART

Applicator insertion
under general
anesthetic



→ 2D or 3D Simulation (Big-Bore
CT or Aquity Machine)

↓ Export image

Treatment Planning System
for Brachy (HDR plus)



↗ Export
data

MultiSource
Co-60



Connecting
applicator and
MultiSource Co-60



↓ Execute
Treatment



RADIOTHERAPY UNIT



WARNING SIGN



PATIENT MONITORING SYSTEM



PATIENT WAITING AREA



2 TREATMENT ROOM

SCOPE OF ACTIVITIES UNDERTAKEN BY RADIATION THERAPIST

- Treat cancer patient using high energy X-ray & electrons.
- Perform simulation (2D & 3D) as part of planning process.
- Help & guide students attached for clinical training.
- Educate patient on radiotherapy by giving counseling.
- Capture orthogonal image or CT images for dose calculation and perform brachytherapy using remote after loading.
- Daily Quality Assurance - To make sure all machine mechanism functioning properly.



EDUCATION OF RADIATION THERAPIST IN MALAYSIA

- **College of radiography and radiotherapy** under ministry of health (MOH), Malaysia
Only college offering diploma of Radiotherapy course in Malaysia , 3 years duration
- Only one university – Health science faculty, **University Kebangsaan Malaysia**. Started in 2000.
Combined discipline – Diagnostic imaging and Radiotherapy.
Award “Degree in Diagnostic imaging and Radiotherapy”
- **Masterskill College**
Just started in 2011
Combined discipline – Diagnostic imaging and Radiotherapy

CURRENT LINAC



VARIAN 2100c

FUTURE LINAC



NOVALIS TX