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.
TREATMENT ALGORITHM

Diagnosis of cancer, Staging and Histology reviewed

Decision 1

No Treatment

Treatment

Decision 2

Radical

Palliative

Decision 1

Primary

Surgery

RT

Systemic

Adjuvant

RT

CCRT

Systemic

Radiotherapy/Chemotherapy/
Palliative surgery/ Procedure
Palliative care
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
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
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.

What is RT Simulation?
IMMOBILIZATION DEVICES

DIFFERENT TYPE OF THERMOPLASTIC DEVICE

VAC-LOK
FRAME
WAX BUILD-UP
TREATMENT ACCESSORIES

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

**SHOULDER RETRACTER** – To pull down shoulder for head and neck cases

**WINGBOARD** - Patient position for chest area

**LUNG CHAIR** - Patient couldn’t lie down because blocking of respiratory 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
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.
The conventional simulation process is very time consuming. In principle 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.
SIMULATOR IMAGE

PRINTED CONVENTIONAL SIMULATION IMAGE AND FILM- AREA OF TREATMENT
To deliver accurate dose inside treatment area
• 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.
• 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 WAITING AREA

PATIENT MONITORING SYSTEM

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