



Evolution of Radiation Therapist from Classical Era to Modern Era

Vinay Kumar Varun*, Unnati shah¹, Dr. Pramod Patil², G. Murali³

1. Chief Radiation Therapist, Department of Radiation Oncology, Kailash Cancer Hospital and Research Centre goraj.
2. Radiation Oncologist HOD, Department of Radiation Oncology, Kailash Cancer Hospital and Research Centre goraj.
3. Chief Medical Physicist cum RSO, Department of Radiation Oncology, Kailash Cancer Hospital and Research Center Goraj.

Corresponding Author: Vinay Kumar Varun, Radiation Therapist, Department of Radiation Oncology, Kailash Cancer Hospital and Research Centre goraj, Muni Seva Ashram, waghodia Gujrat, India

Copy Right: © 2022 Vinay Kumar Varun, this is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Received Date: December 31, 2021

Published Date: January 05, 2022

History of radiotherapy

- In 1896 a German physics professor, Wilhelm Conrad Roentgen, presented a remarkable lecture entitled “Concerning a New Kind of Ray.” Roentgen called it the “X-ray”, with “x” being the algebraic symbol for an unknown quantity. There was immediate worldwide excitement. Within months, systems were being devised to use x-rays for diagnosis, and within 3 years radiation was used to treat cancer.
- The first patient was treated with radiation in 1896, two months after the discovery of X-ray.
- Rapid technology advance began in the early 1950s with cobalt unit followed by linear accelerators a few years later.
- Recent technology advances have made radiation more effective and precise.



Figure 1



Figure 2

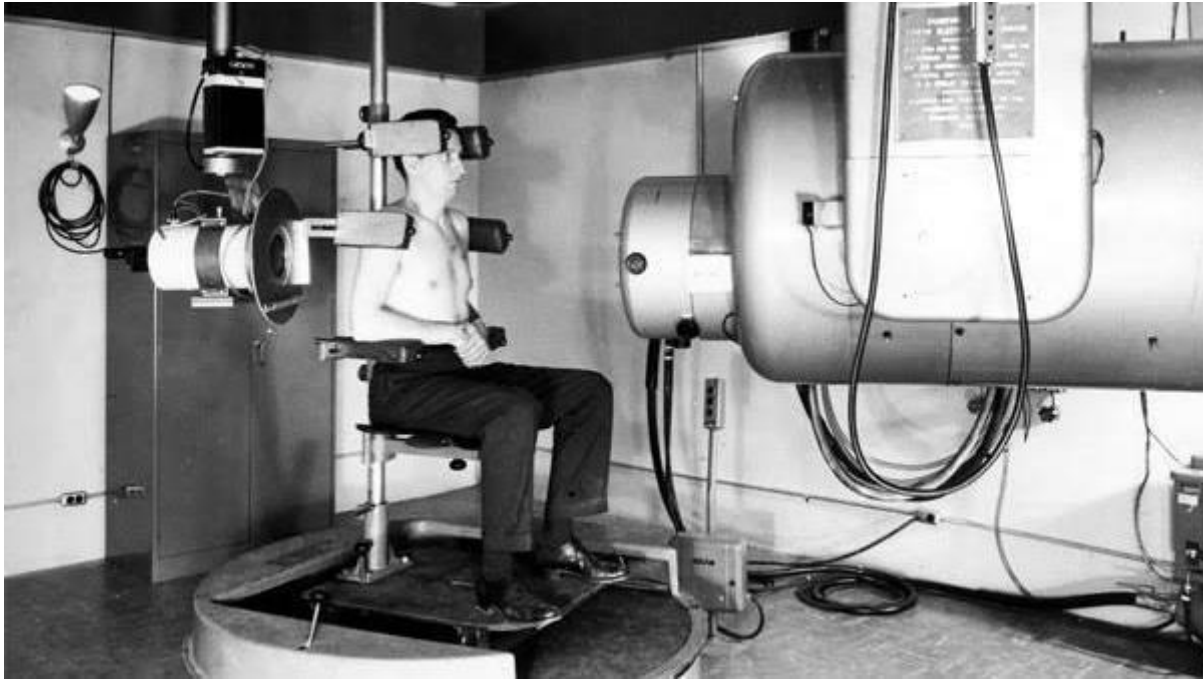


Figure 3

The journey from co-60 to linacs

OLDEN days treatment

- No proper Immobilization
- X-ray film
- Conventional field marking
- Treatment

execution Modern

days treatment

- Simulation (proper immobilization)
- Fluoroscopy/CT based plan
- Contouring
- Conformal plan in TPS
- QA
- Image verification before treatment

- PV/OBI Followed with CBCT
- Treatment execution
- Launched record & verified mode in the system
- Less manual workload
- All work done manually

Era's for Rtt



Figure 4

Early 2000's(CT based Simulation)

- After a few years, when conformal Trt. Modality came into existence, we were able to deliver high precision trt. Technique i.e. IMRT
- This time RT technologist got an effective role.
- Proper immobilizing devices
- Proper Image matching & execution of treatment.

Challenges Faced in the Classical Era

No proper Immobilization, no imaging

» Chances of patient movement & missing required field.

- » More harm to normal structure
- » More skin reaction, no record of Treatment in system
- » Awkward feeling of patients in the public area due to having field marking over body

Advancement in imaging & Treatment modalities

Advancement in imaging

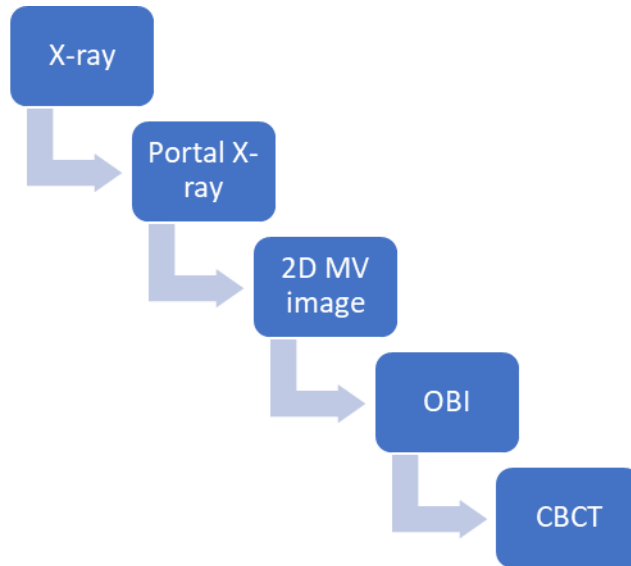


Figure 5

Treatment modalities

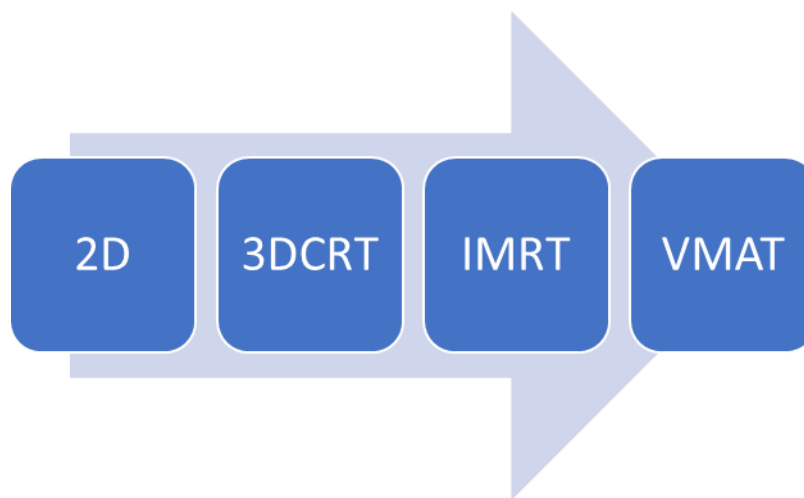


Figure 6

Because of advancement in imaging, we got better treatment modalities to deliver high dose RT like SRS SBRT SRT and also able to do DIBH GATING treatment (able to track breathing and movements)

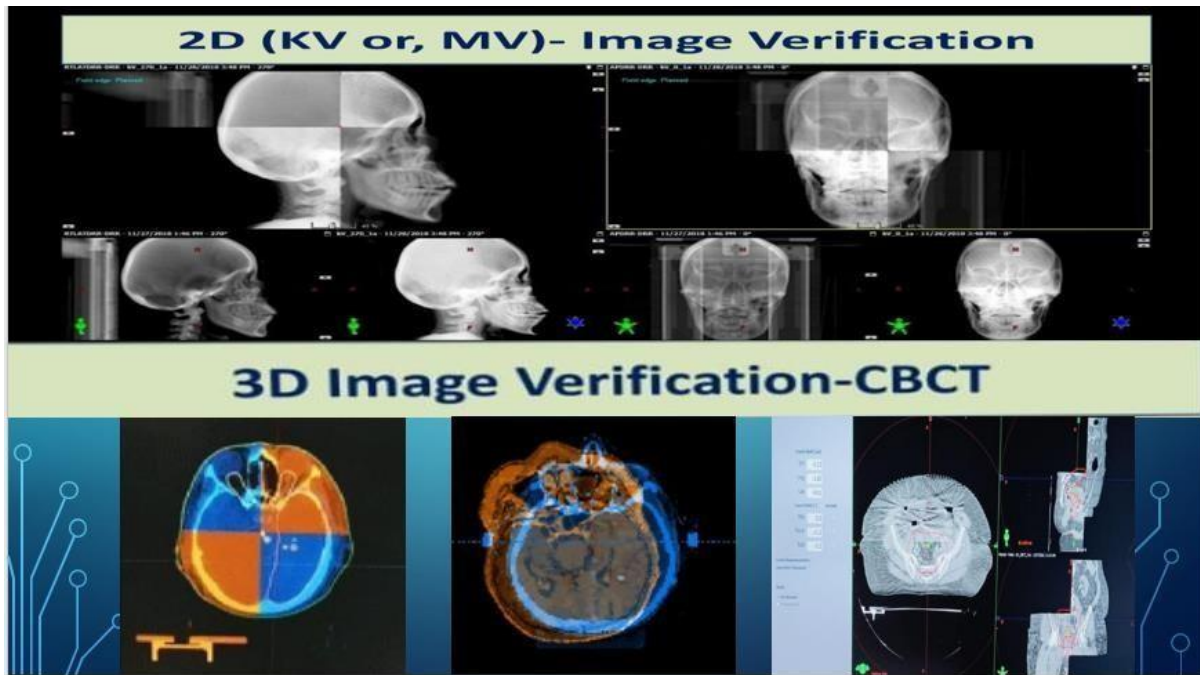


Figure 7

Who is a radiation therapist?

- Key member in the treatment of cancer patients.
- Responsible for planning and delivering therapeutic doses of ionizing radiation as prescribed by radiation oncologist. A critical role in treatment planning, treatment delivery and verification of patient care and support, and delivering safe and accurate treatment.



Figure 8

Roles of Radiation Therapist

- Simulation- Immobilizing the patient by making cast and vaclock(Various immobilizing devices)so the patient can't move during treatment.
- Proper Positioning & Immobilization is the first and most important step in treatment.



Figure 9



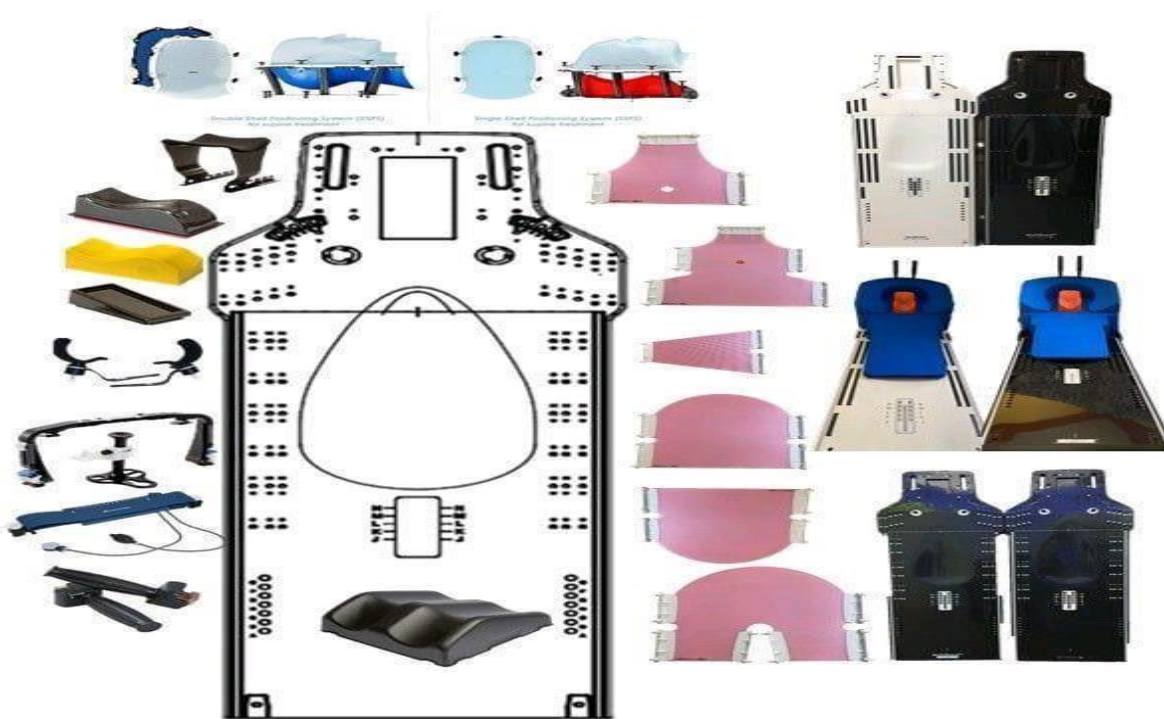
Figure 10



Figure 11

Requirements for Simulation

1. AIO base plate
2. Index bar
3. Varieties of Headrest
4. All types of thermoplastics mask
5. V-bar & Nobs
6. Vaclock
7. Breastboard and Pelvicboard
8. Knee rest





Indigenous Head Rest

Planning, treatment and counseling

- After Simulation, we take patient CT for planning and contouring (this will be done by an oncologist & physicist)
- Patient QA will be done by a physicist for dosimetry purposes before treatment.
- After all this patient will be informed and called up for treatment after planning is completed.

Process of Treatment startup

- When we are taking the patient first time, we will counsel the patient to summarize the patient about the treatment process.
- Lying down the patient over the couch, reproducing the Simulation process for setup.
 - ◇ Checking the proper head rest, vaclock orbit and any other immobilizing device used during the time of Simulation.
 - ◇ After finishing the setup, we will shift center (References level marked at Ct) to isometric done by a physicist or some in an advance machine having delta Shift.
- Before Treatment we will do On-Board Imaging (PV/OBI Followed by CBCT)
- In OBI/PV, we will match the bony landmark and in CBCT we will check soft tissue & bony landmarks and assure that there is no shrinking of soft tissue or swelling of tissue in the PTV area given by an oncologist.
- After all, check up, we will expose the patient to the dose prescribed by an oncologist.

Verifying images

- Major role after Simulation is delivering the dose to prescribe area checking cbct for orbit gap, swelling & setup error and identifying and conveying to an oncologist and taking back for Resimulation.
- Some faulted Cases in which we needed to do resimulation Like-



Figure 12



Figure 13

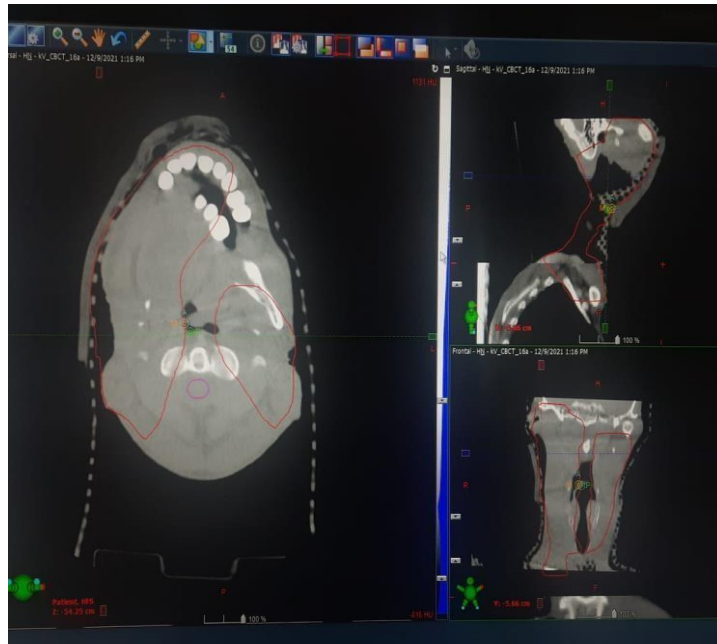


Figure 14

Challenges facing in modern Era for rtt

Head & neck cases

- To give more accurate & precise treatment with less margin around CTV.
- Due to a very tight margin around CTV without imaging, there is a chance of missing target.
- Skin reaction or tight orfit can lead patients to not lying down properly.

Breast & Pelvis

- Due to shrinkage of orfit, it becomes more tight setup, sometimes patient feel uncomfortable in laying down.
- Daily bladder position vary in the pelvis
- Due to tight orfit patient feels difficulty in breathing.

DIBH/GATING

- Technique for tracking breathing and for moving tumor position with breathing.

- Sometimes Patient can't co-operate, with breath-hold, so it takes long time
- Breathing patterns differ in imaging & treatment time.

Srs/srt/sbrt

- High dose radiation in single or multiple fractions.
- This needed to be more precise as it's high dose
- No margin or very much less margin, needed a perfect setup perfect matching and no movement, for fewer consequences.



Figure 15

- **Technician:** a person employed to look after technical equipment
- **Technologist:** an expert in a particular field of technology – Machine oriented
- **Therapist:** a person skilled in a particular kind of therapy – Patient oriented
- **Radiation Therapists are technologist and carers**
- **Definition of caring in reference to Radiation Therapists is:**
Providing **emotional** support, **explaining** the procedure in a manner the patient can understand, permitting the patient to **express emotion, actively listening** to a patient's concerns and **responding** in an **empathetic** manner and recognizing the patient as a **unique** individual rather than just another case.

Figure 16

Required Skills For radiation Therapist

- Strong interpersonal skill
- Extremely detail oriented
- Ability to reproduce Simulation setup
- Ability to perfectly understand bony landmarks for 2D image matching.
- Ability to read CT images for 3D view of CBCT image matching.
- Ability to identify the setup error & rectify the error in short span of time.
- Ability to counsel the patient and can explain treatment procedure to patients.
- Emerging role in patient management and also Administrative roles.
- Ability to stand for long periods of time and also help to lift patient.
- Should have knowledge of Radiotherapy theory and practical, so that they can train fresher in systematic way.
- Should have sharp mind to understand & follow Radiation Oncologist command.

Conclusion

- Don't do anything blindly because it's a matter of someone's life.
- Be focused, alert, sharp and keep 100% concentration while doing treatment.
- Once shot from the gun can't revert back as same like in radiation Once radiation delivered to patient can't revert back, be very accurate.

