TSU

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Teletheraphy treatment planning

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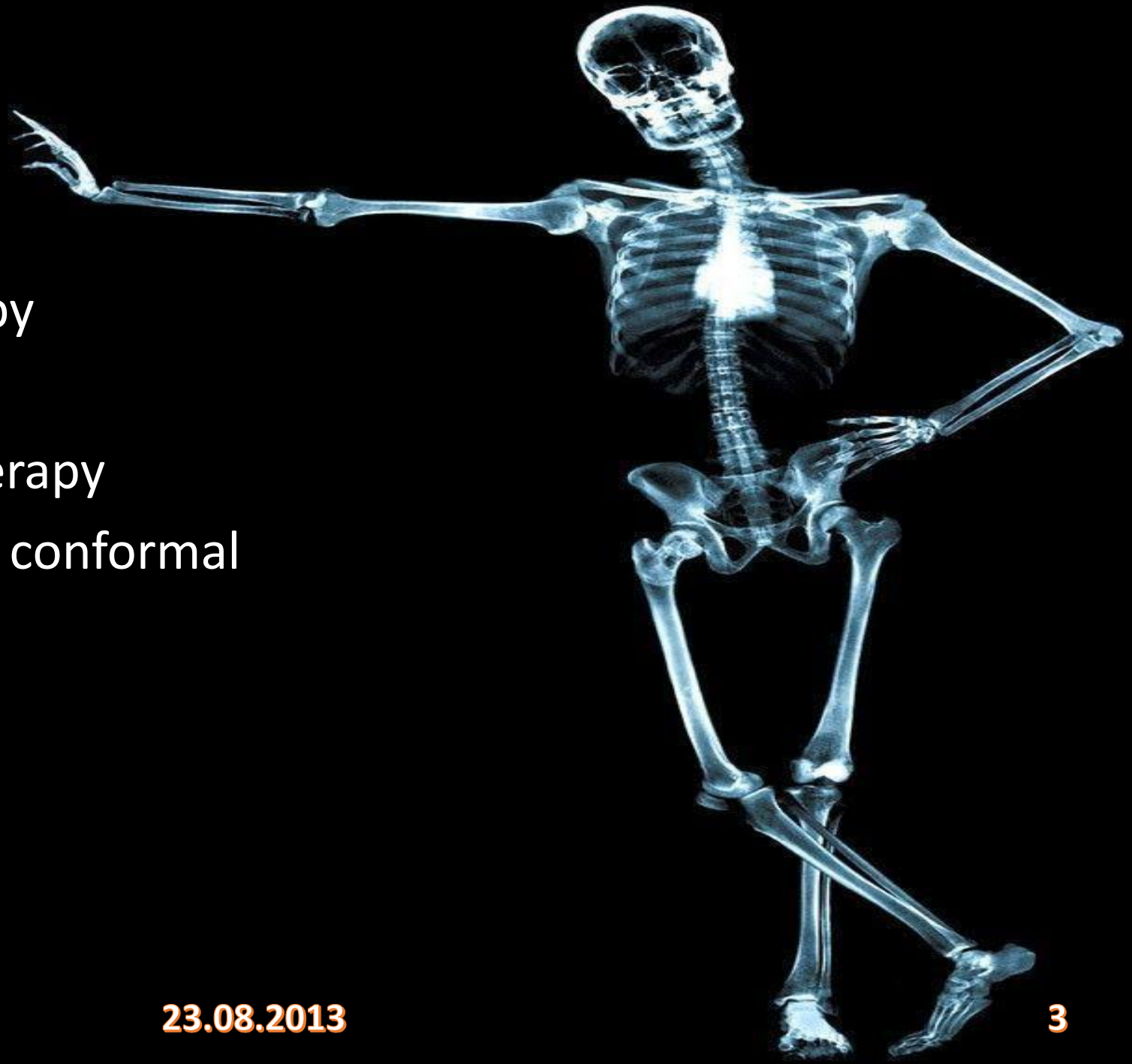
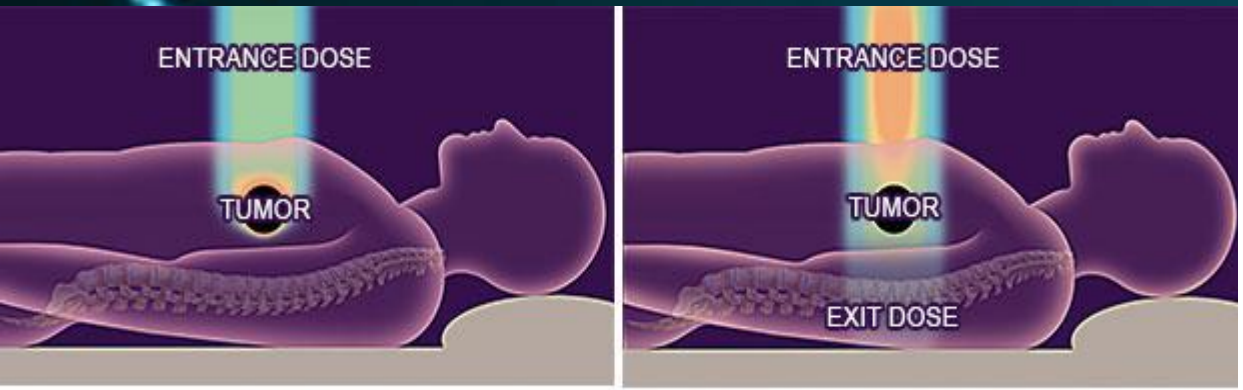


- ✓ External Beam Therapy
- ✓ linear Accelerator
- ✓Planning Radiation Therapy
- ✓ CT-simulation and 3D conformal (IMRT, VMAT)
- ✓ Treatment delivery

Radiation Therapy is used to....

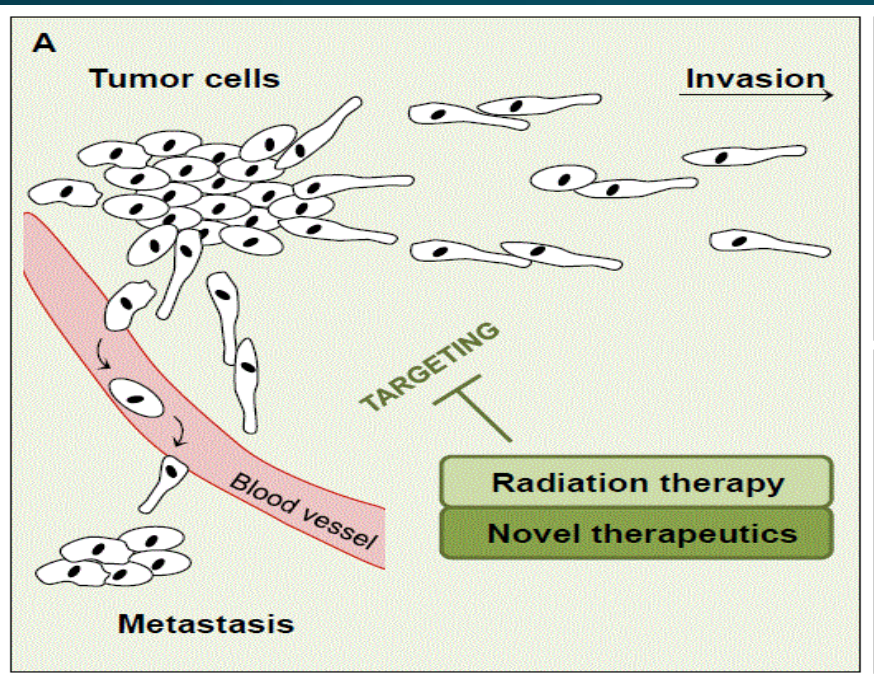
- ✓ Breast Cancer Treatment
- ✓ Colorectal (Bowel) Cancer Treatment
- ✓ Esophageal Cancer Treatment
- ✓ Head and Neck Cancer Treatment
- ✓ Lung Cancer Treatment
- ✓ Prostate Cancer Treatment
- ✓ Brain Tumor Treatment

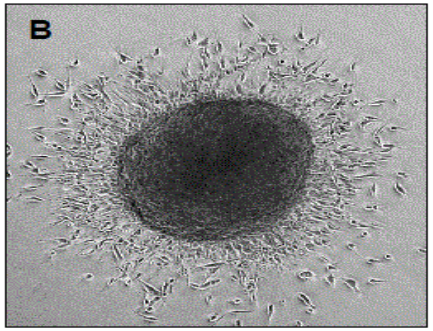
E B T

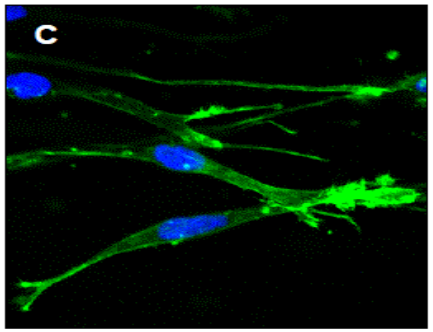


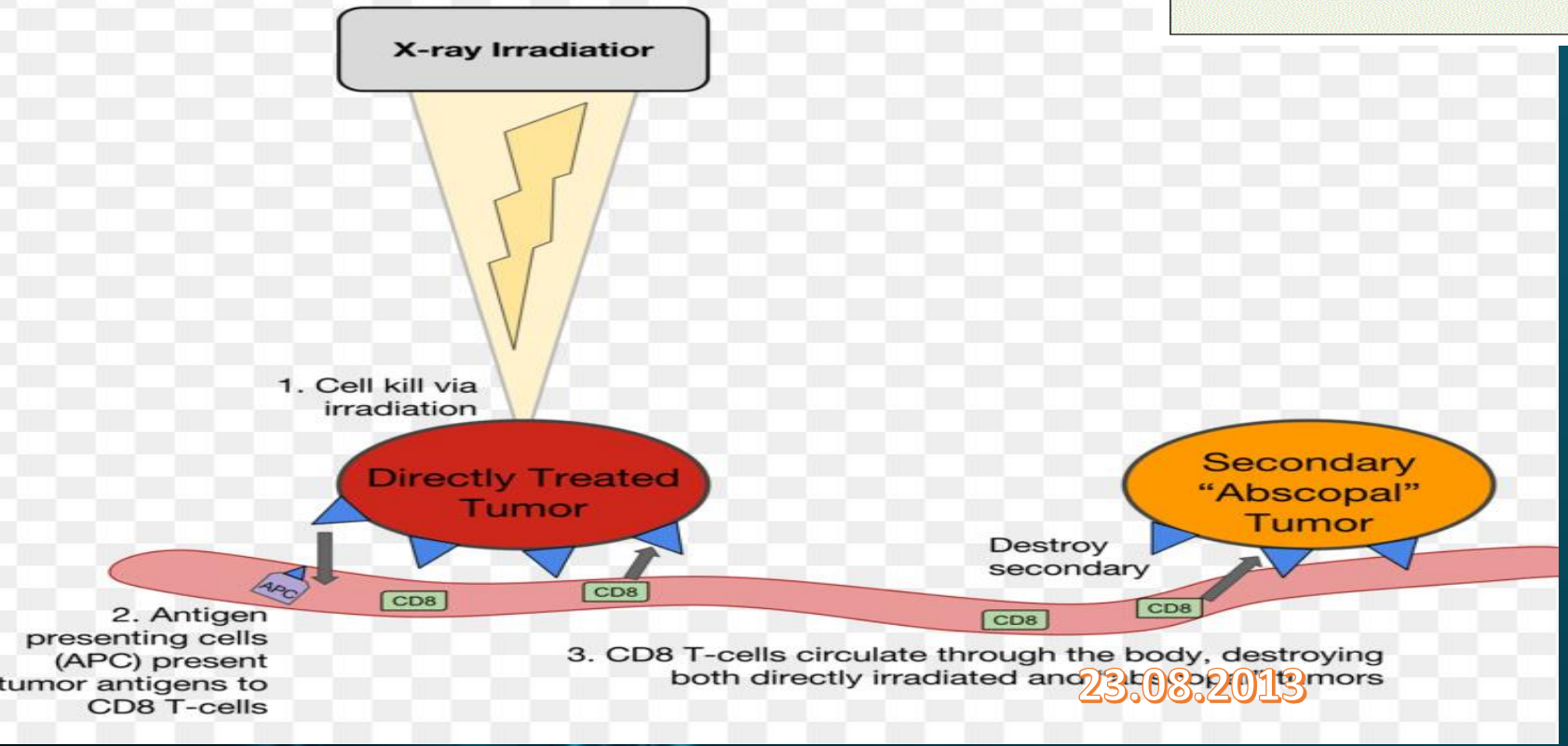
TARGETED PROTON THERAPY:
Deposits most energy on target

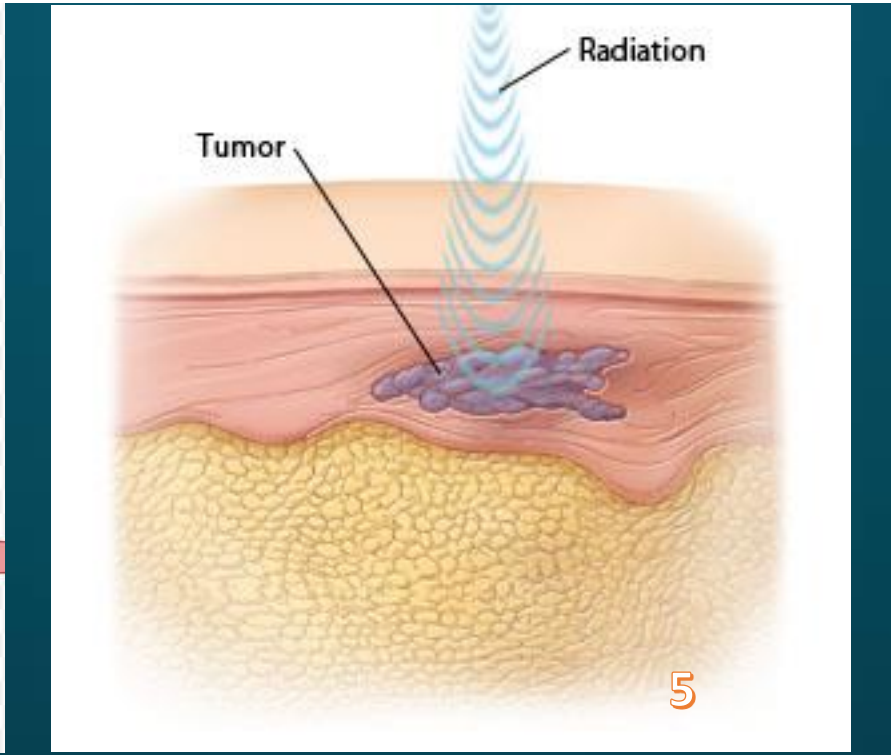
CONVENTIONAL RADIATION THERAPY:
Deposits most energy before target

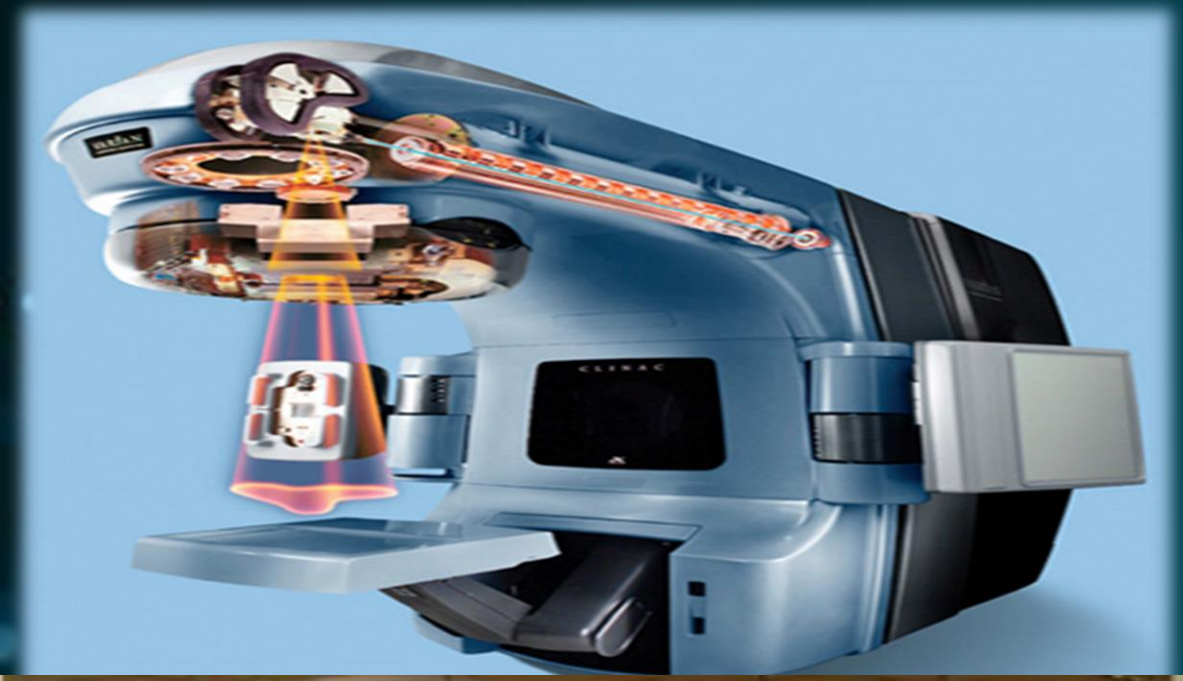












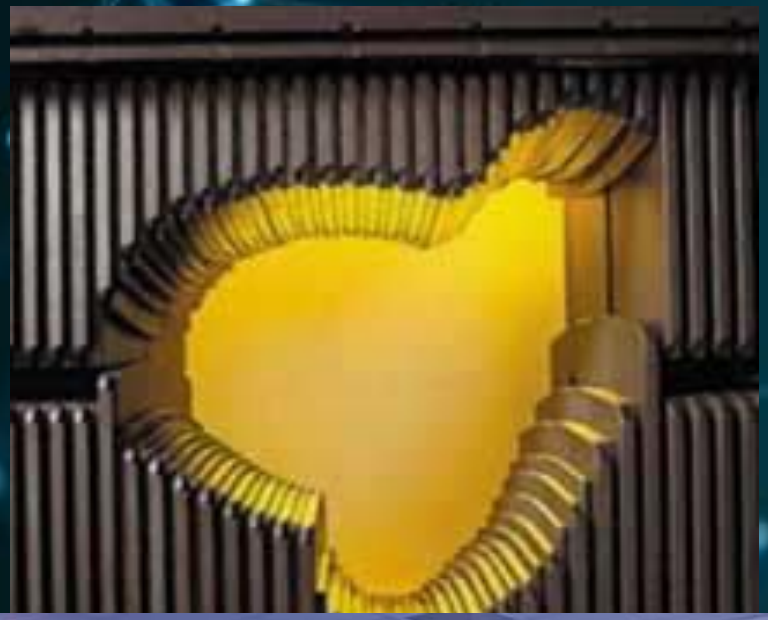
Linear Accelerator

The linear accelerator (Linac), uses microwave technology to accelerate electrons in a part of the linac called waveguide, then allows these electrons to collide with a heavy metal target.

As a result of these collisions, high energy X-Rays (Photons) are produced from the target.

This is the most common device to treat cancer with external beam radiation.

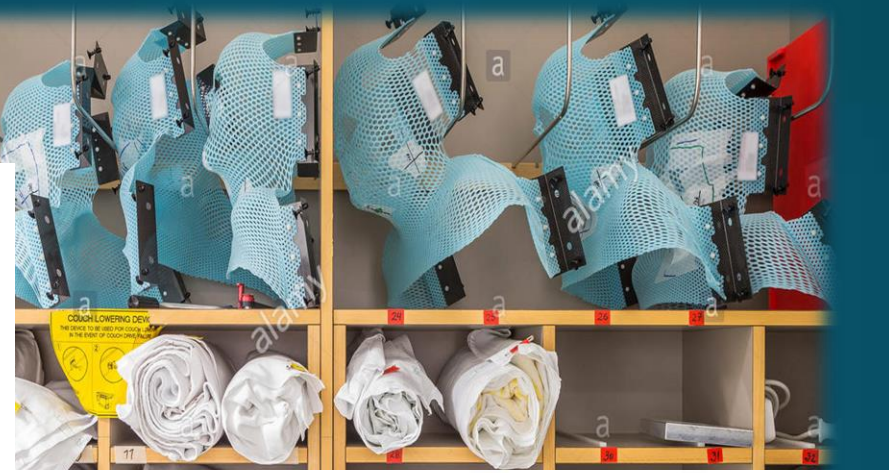
Gantry, Couch and Multi leaf Collimators



Gantry:
A frame housing the x-ray tube, collimators, and detectors in a CT or radiation therapy machine, with a large opening into which the patient is inserted; a mechanical support for mounting a device to be moved in a circular path.

MLC's: They are heavy metal field-shaping devices with independent moving mechanisms used to create a custom like block to spare normal tissue and direct the radiation dose to the tumor.

Radiotherapy Treatment Planning System



Masks, pads or other immobilization devices are typically used to help the patient to hold still and in a specific position during the simulation.

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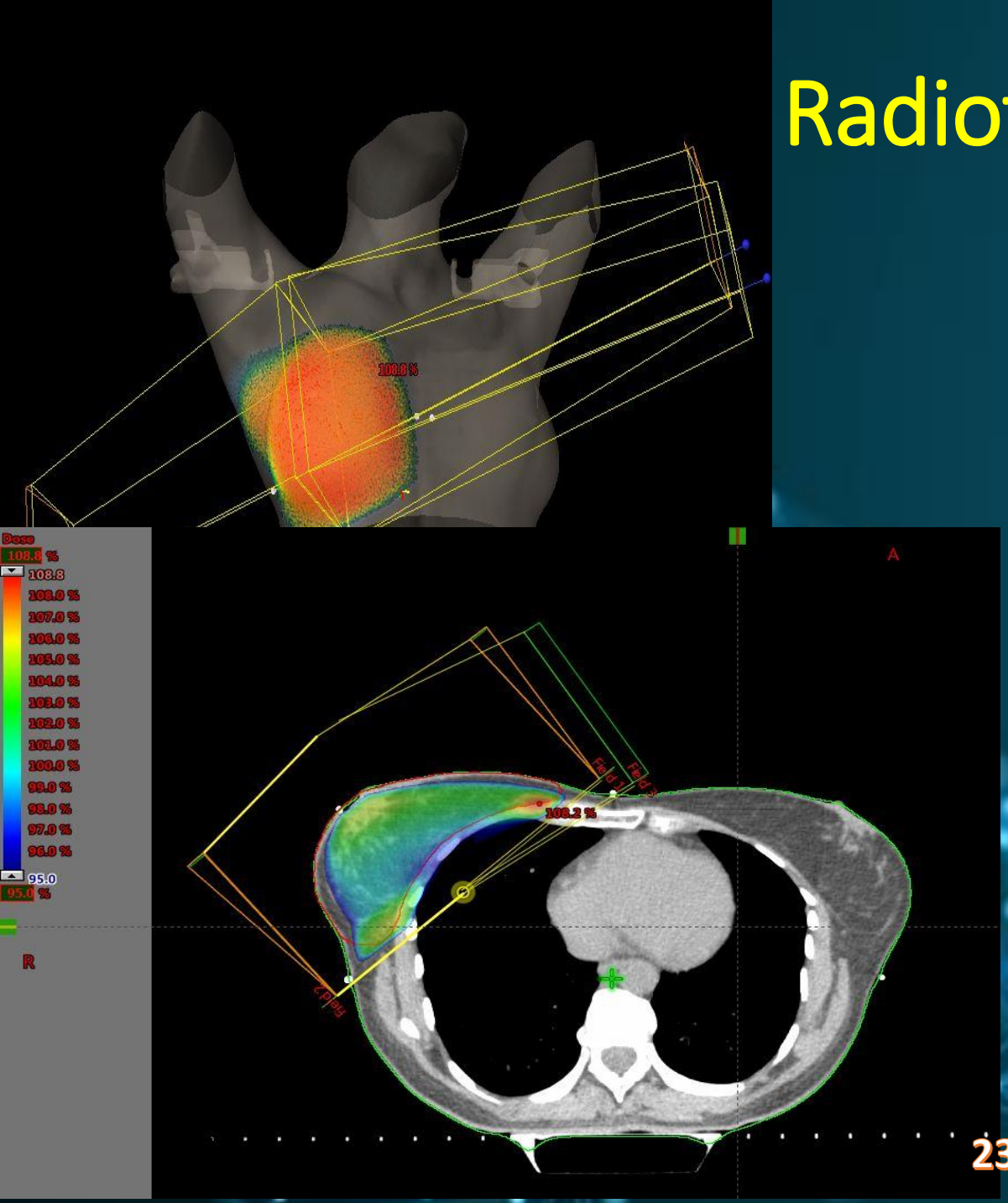
Radiotherapy Treatment Planning



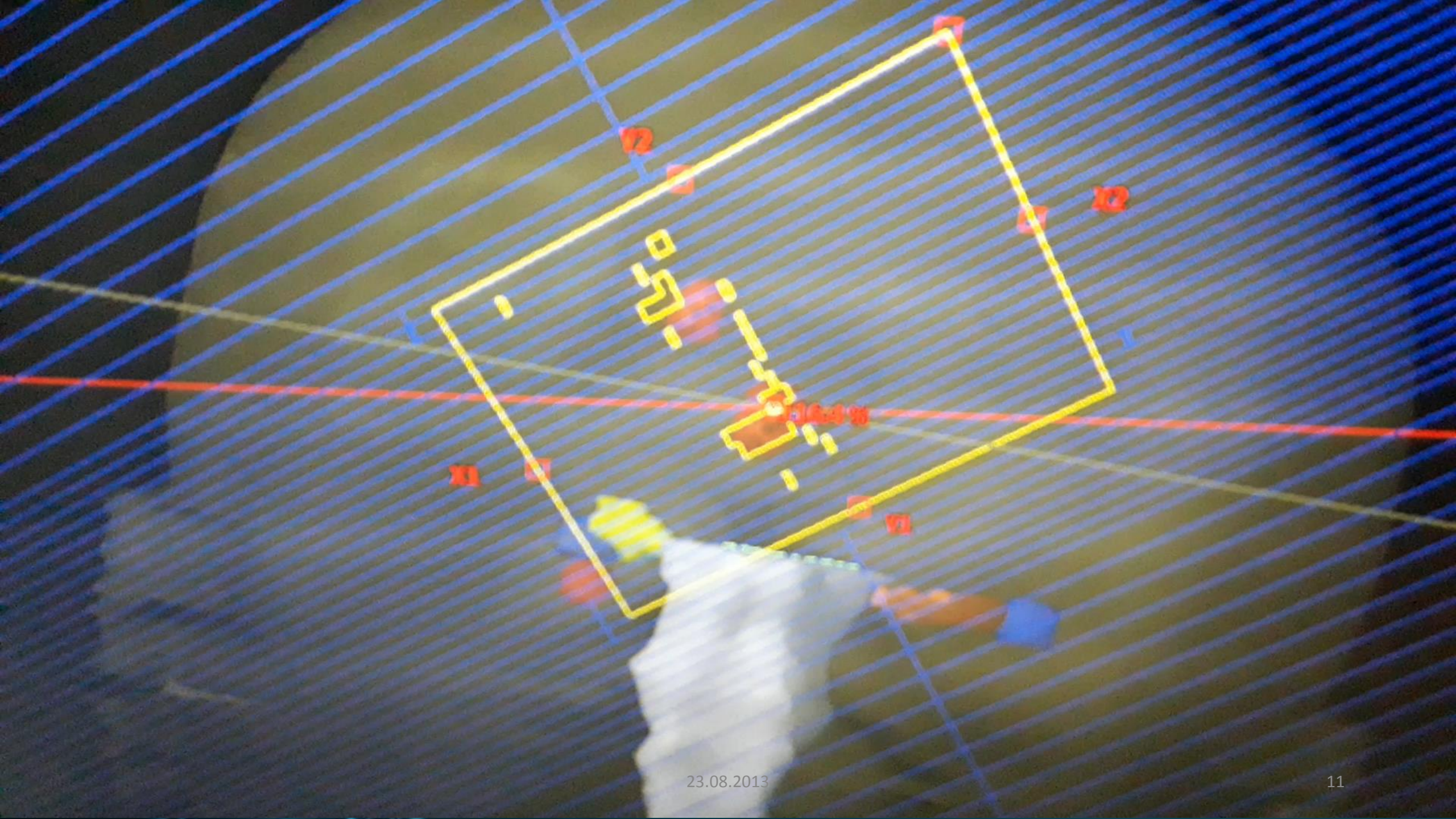
The LINAC is used to treat all body sites, using conventional techniques, Intensity-Modulated Radiation Therapy (IMRT), Volumetric Modulated Arc Therapy (VMAT)

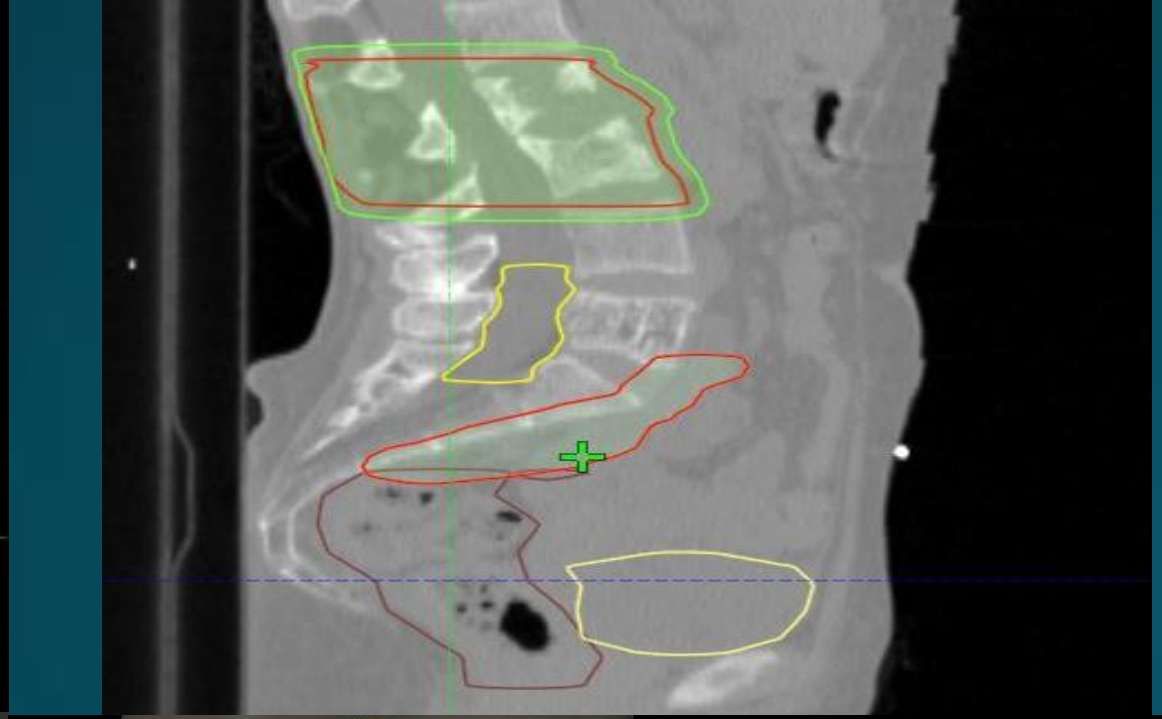
3D conformal radiation therapy is a cancer treatment that shapes the radiation beams to match the shape of the tumor.

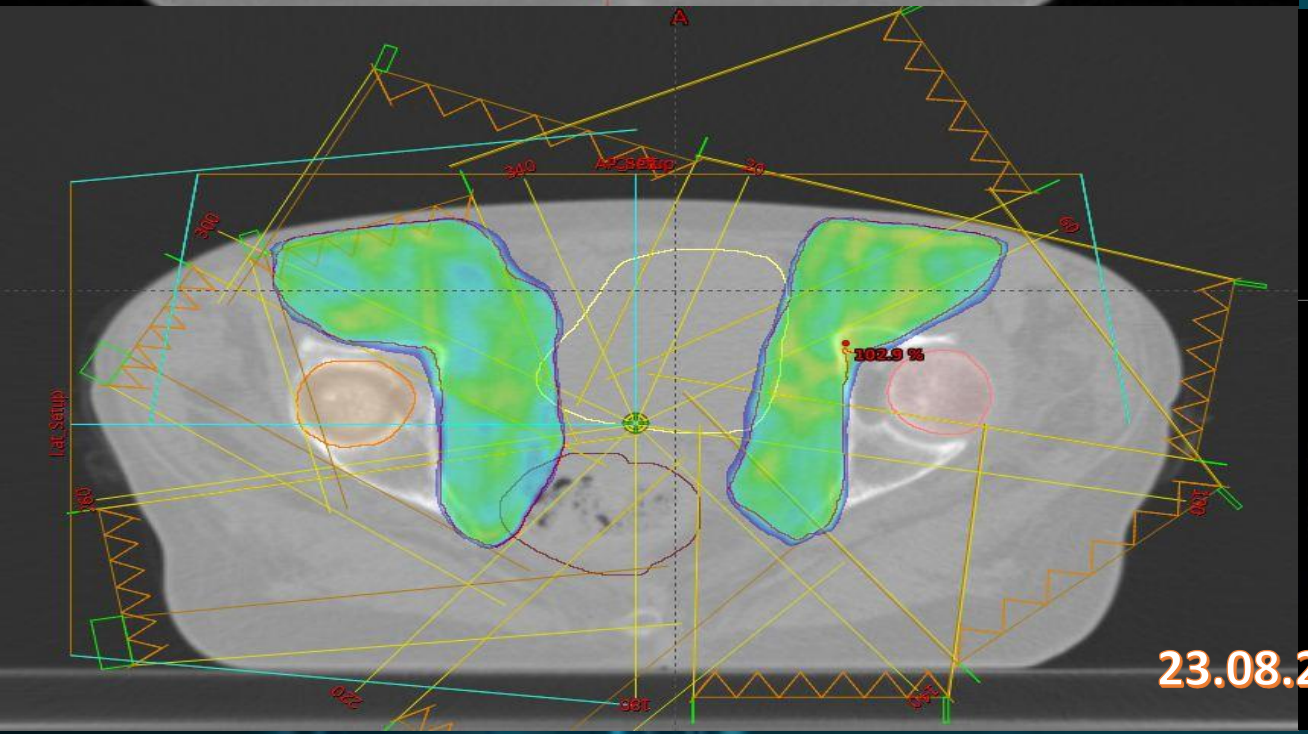
The radiologist will take a 3D image of patient's tumor, often using one of the following imaging methods:

- CT (computed tomography) scan.
- MRI (magnetic resonance imaging).
- PET (positron emission tomography) scan.
- PET-CT scan.

Then, a computer program analyzes the 3D image and designs radiation beams that conform to the shape of the tumor.







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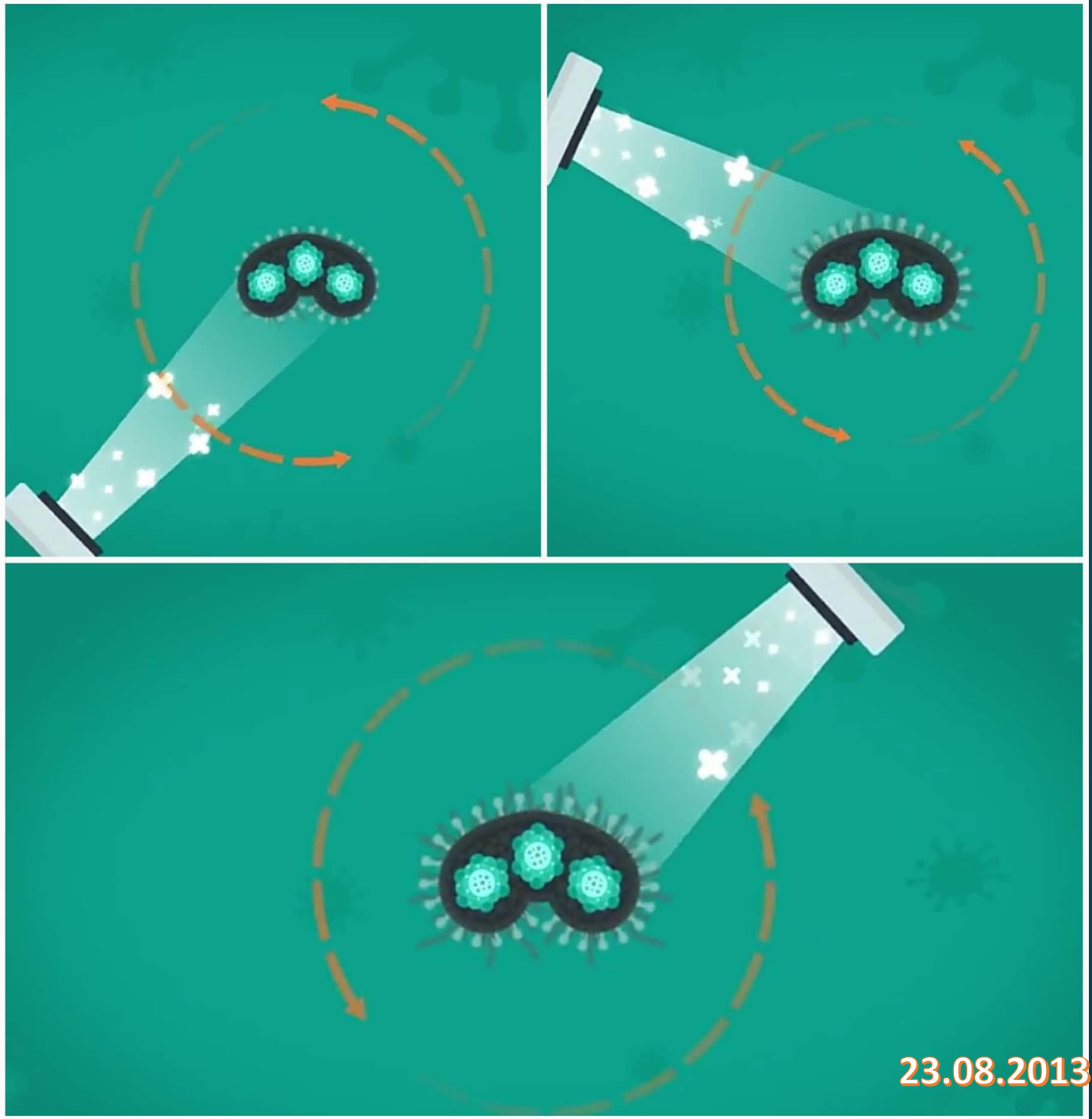
(I M R T)

Intensity-modulated radiotherapy (IMRT) uses linear accelerators to safely and painlessly deliver precise radiation doses to a tumor while minimizing the dose to surrounding normal tissue.

Cancer is irradiate from the different angels of beam.



(V M A T)

Volumetric Arc Therapy (VMAT) is an advanced form of intensity-modulated radiotherapy, when the machine is moved around the patient , changed beam shape and treatment dose automatically.

In most cases the total dose of radiation needed to kill a tumor can't be given all at once. This is because a large dose given one time can cause more damage to nearby normal tissues. This can cause more side effects than giving the same dose over spread out into many treatments.

The total dose of external radiation therapy is usually divided into smaller doses called fractions.
Most patients get radiation treatments daily, 5 days a week , for 5 to 8 weeks. Weekend rest breaks allow time for normal cells to recover.
The total dose of radiation and the number of treatments is based on:

- The size and location of the cancer
- The type of cancer
- The reason for the treatment
- patients general health

Consraints of Dose

ORGAN	CONSTRAINTS
CNS (1.8-2.0 Gy/fx)	
Spinal cord	**max 50 Gy** (full cord cross-section); tolerance increases by 25% 6 mos after 1st course (for re-irradiation) (QUANTEC)
Brain	**max 72 Gy** (partial brain); avoid >2 Gy/fx or hyperfractionation (QUANTEC)
Chiasm/optic nerves	**max 55 Gy** (QUANTEC)
Brainstem	**Entire brainstem <54 Gy, V59 Gy <1-10 cc** (QUANTEC)
Eyes (globe)	**Mean <35 Gy** (RTOG 0225), **max 54 Gy** (RTOG 0615)
Lens	**max 7 Gy** (RTOG 0539)
Retina	**max 50 Gy** (RTOG 0539)
Lacrimal Gland	**max 40 Gy** (Parsons)
Inner ear/cochlea	**mean ≤45 Gy** (consider constraining to ≤35 Gy with concurrent cisplatin) (QUANTEC)
Pituitary gland	**max 45 Gy** (for panhypopituitarism, lower for GH deficiency) (Emami)
Cauda equina	**Max 60 Gy** (Emami)

After the simulation and planning have been completed, the treatment can begin.

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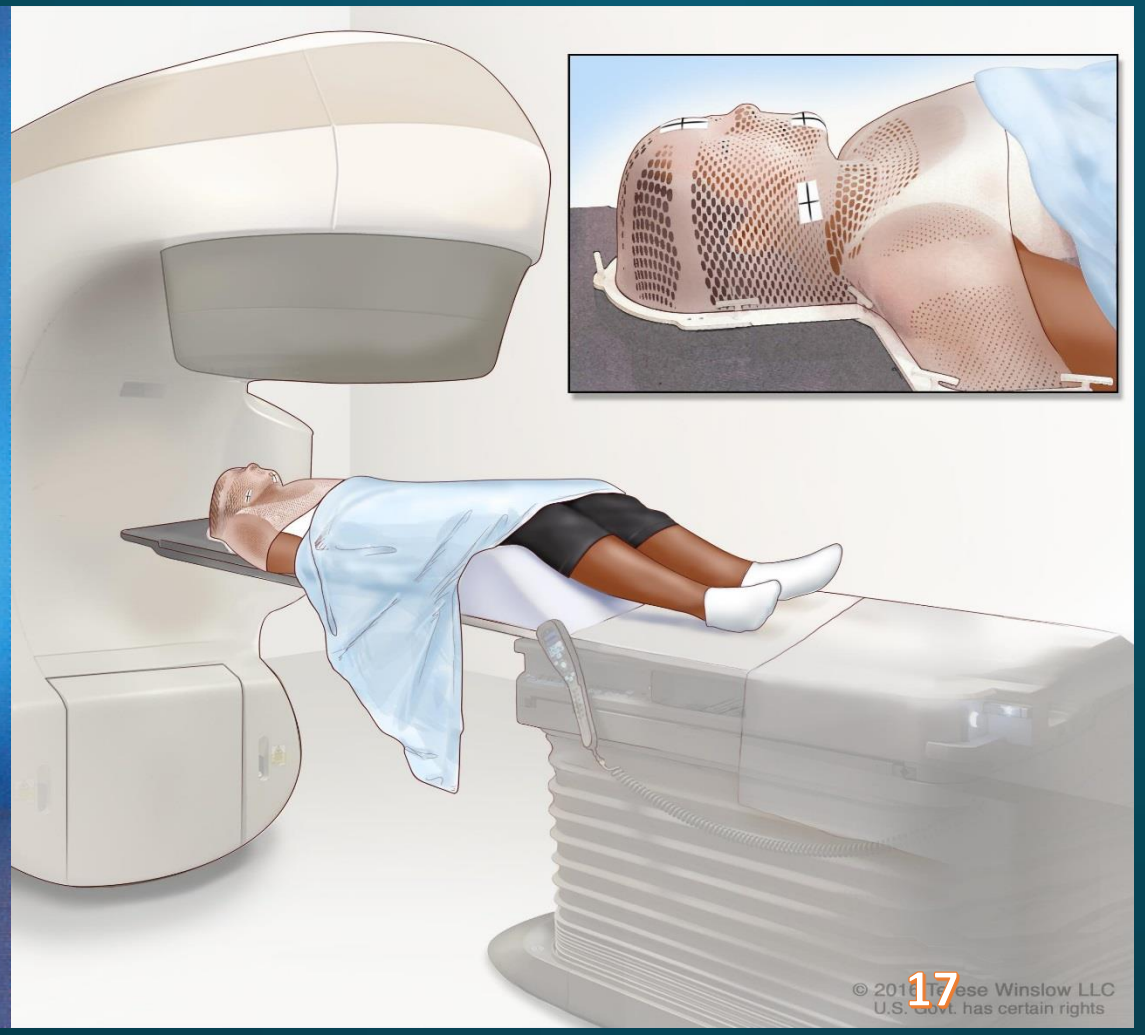
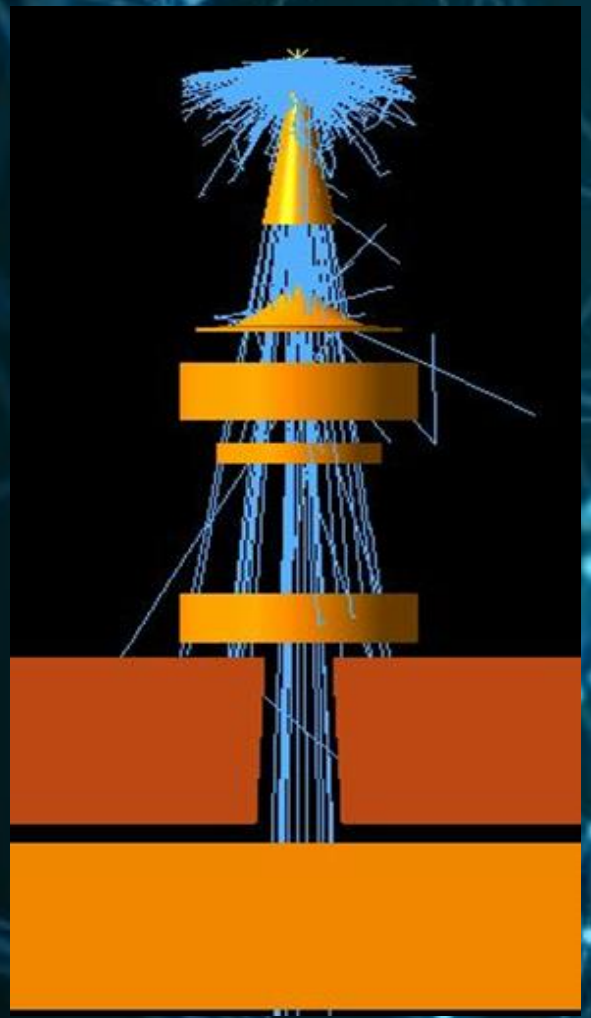
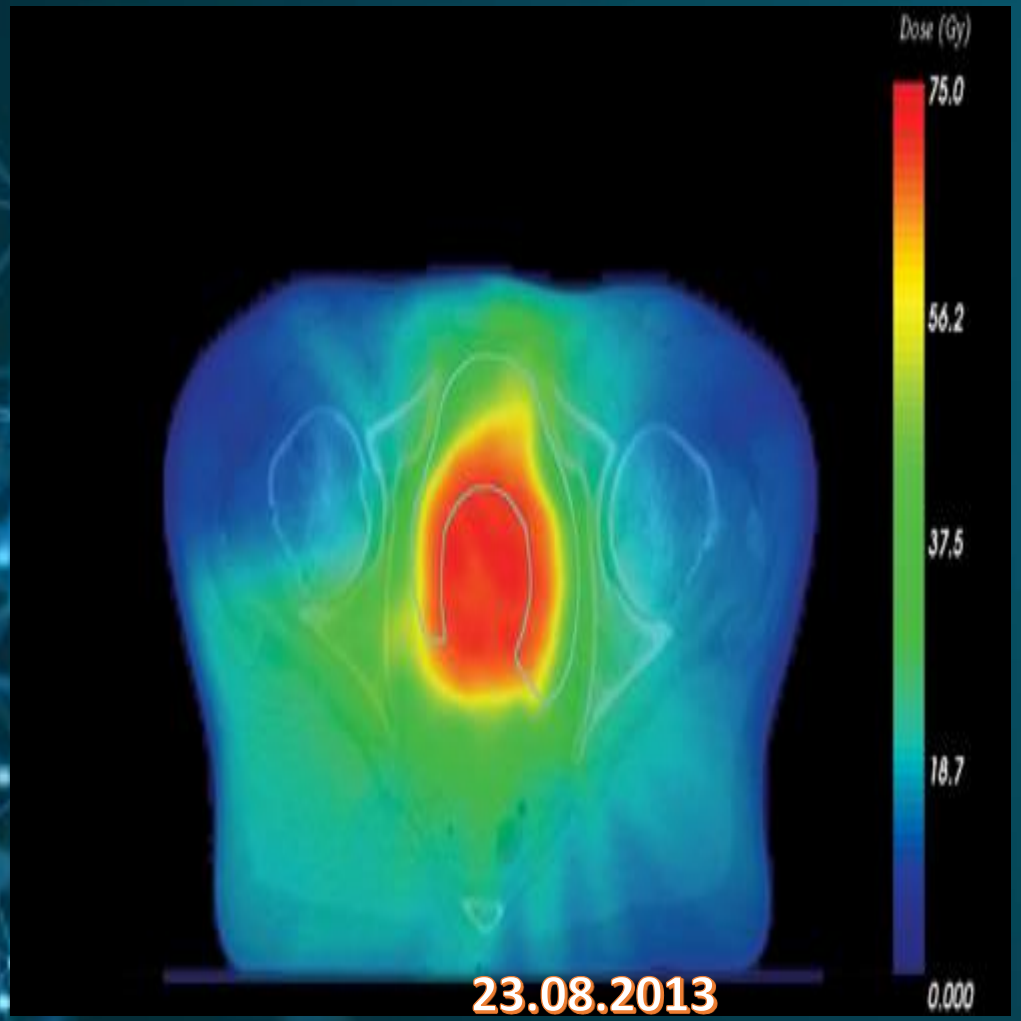
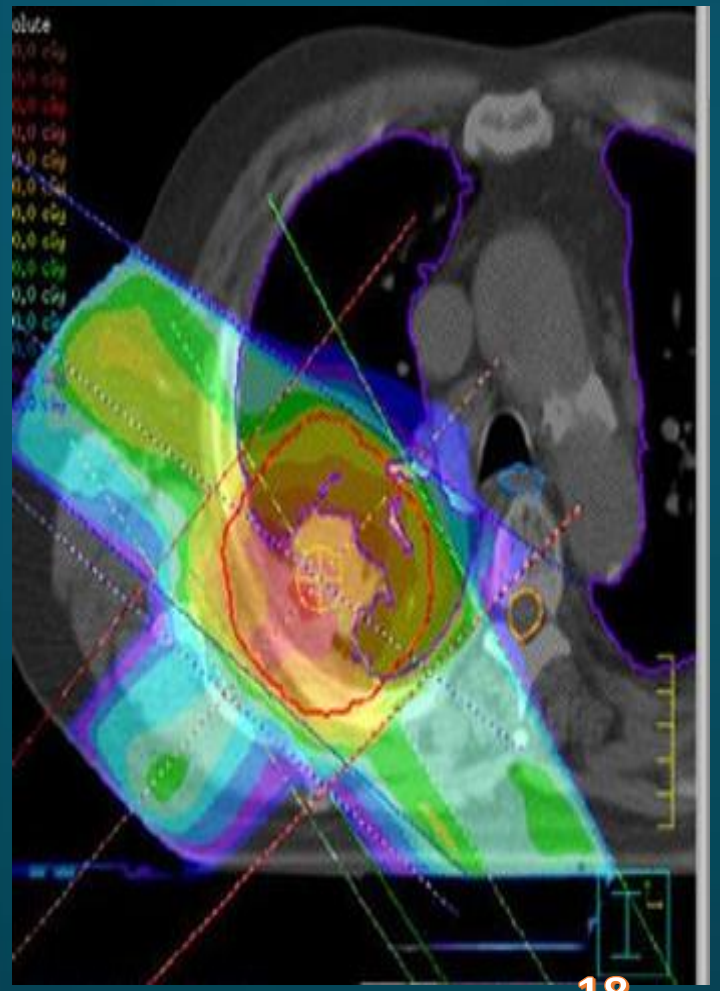


Important => make a good plane







Patient safety is very important and is assured in several ways.

Before treatment is delivered to the patient, a treatment plan is developed and approved by the radiation oncologist in collaboration with the radiation dosimetrist and medical physicist. The plan is double-checked before treatment is given and quality-assurance procedures are performed to ensure that the treatment will be delivered as planned.

Thanks for your attention!