

Radiation Therapy for Sarcoma

Behrooz Hakimian, M.D.

Associate Professor Department of Radiation Oncology

Cedars Sinia Medical Center



outline

What is radiation?

How does radiation work?

Why use radiation in sarcoma?

What is the process of radiation treatment?

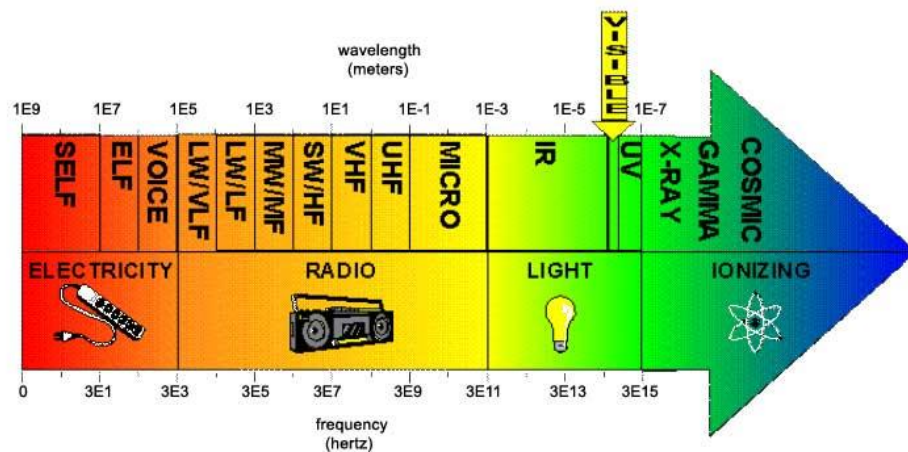
What are the radiation modalities?

What are the Machines used?

What is Radiation?

Radiation is a form of energy

there's a spectrum of radiation from
radio waves to high energy gamma
Rays



How Does Radiation Work?

Radiation Damages the DNA of growing cells

If damage is severe , the cells are doomed to die

If the damage is repaired ,no harm is done and cell continues to divide

cancer cells are not able to repair themselves well compared to the normal cells and preferentially die

therefore we can take advantage of the difference and control the cancer

Radiation therapy is localized treatment and generally does not affect the rest of the body

Goals of Radiation Therapy

Curative treatment

provide local control of tumors

for sarcomas combined with surgery

treatment can take several weeks

Palliative treatment

provide symptoms relief

shrink tumor affecting quality of life

Why Use Radiation for Sarcoma?



Surgery would be good to eradicate the trunk of a tree; however, the roots will eventually grow and result in growth of a new tree

radiation therapy can help to eradicate the roots that surgery cannot remove

Radiation therapy is used in combination with surgery to control the primary tumor in the limbs and prevent amputation

Also radiation therapy can be used to control some of the metastatic sites

Radiation Oncology Workflow

Consultation

- Referred from another physician
- Tissue diagnosis obtained
- Discuss goals of treatment and potential side effect

Simulation

- Typically done with CT scanner
- May be done clinically

Treatment

- Daily (Mon – Fri)
- Ranges between 1-35 days

Follow-up

- Short- & Long-term

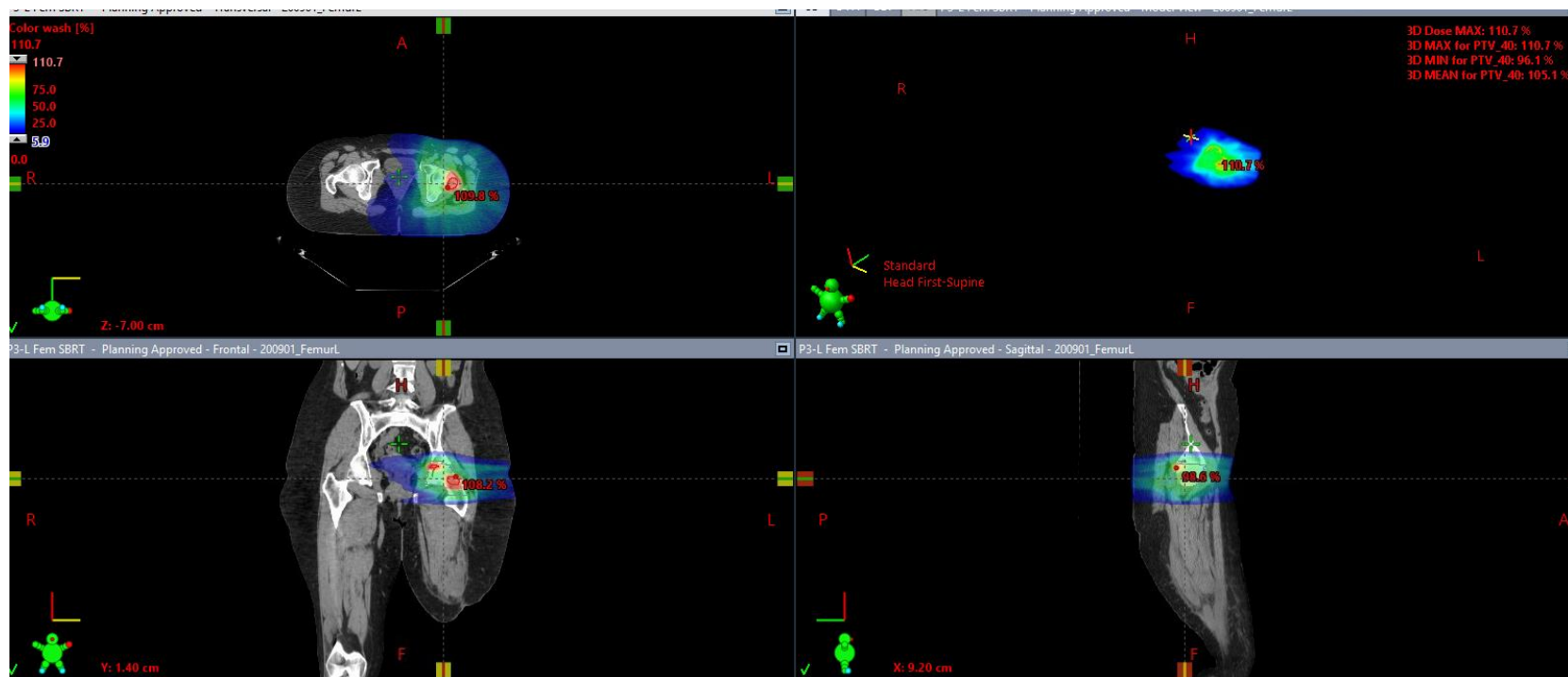
Radiation Therapy Flow

Simulation

- Set up patient in treatment position
- Make any special equipment used for patient setup reproducibility
 - Mask
 - Alpha cradle (“bean bag”)
 - Breast Board



PLanning



Safety and Quality Assurance

Each radiation therapy treatment plan goes through many safety checks

The medical physicist checks the calibration of the linear accelerator on a regular basis to assure the correct dose is being delivered

The radiation oncologist, along with the dosimetrist and medical physicist go through a rigorous multi-step QA process to be sure the plan can be safely delivered

QA checks are done by the radiation therapist daily to ensure that each patient is receiving the treatment that was prescribed for them

Delivery of Radiation Therapy (RT)

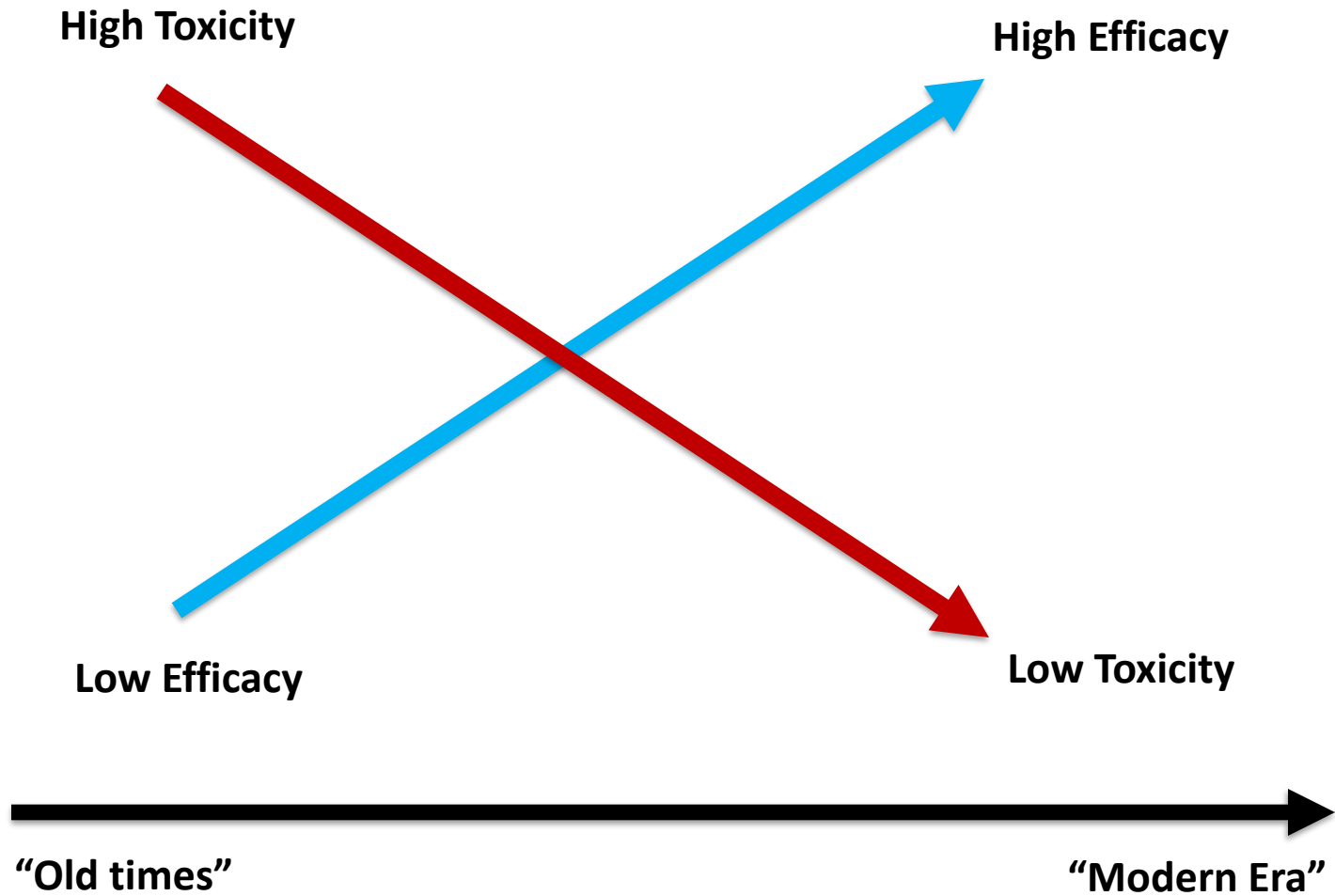
External beam RT is
delivered to patient by a
linear accelerator

Unit of radiation: Gray (Gy)

Second most common type
of radiation is *brachytherapy*
(internal radiation)



Goal of Modern RT



Methods of Radiation Delivery

Two-dimensional radiation therapy (2D)

Three-dimensional conformal radiation therapy (3-D CRT)

Intensity modulated radiation therapy (IMRT)

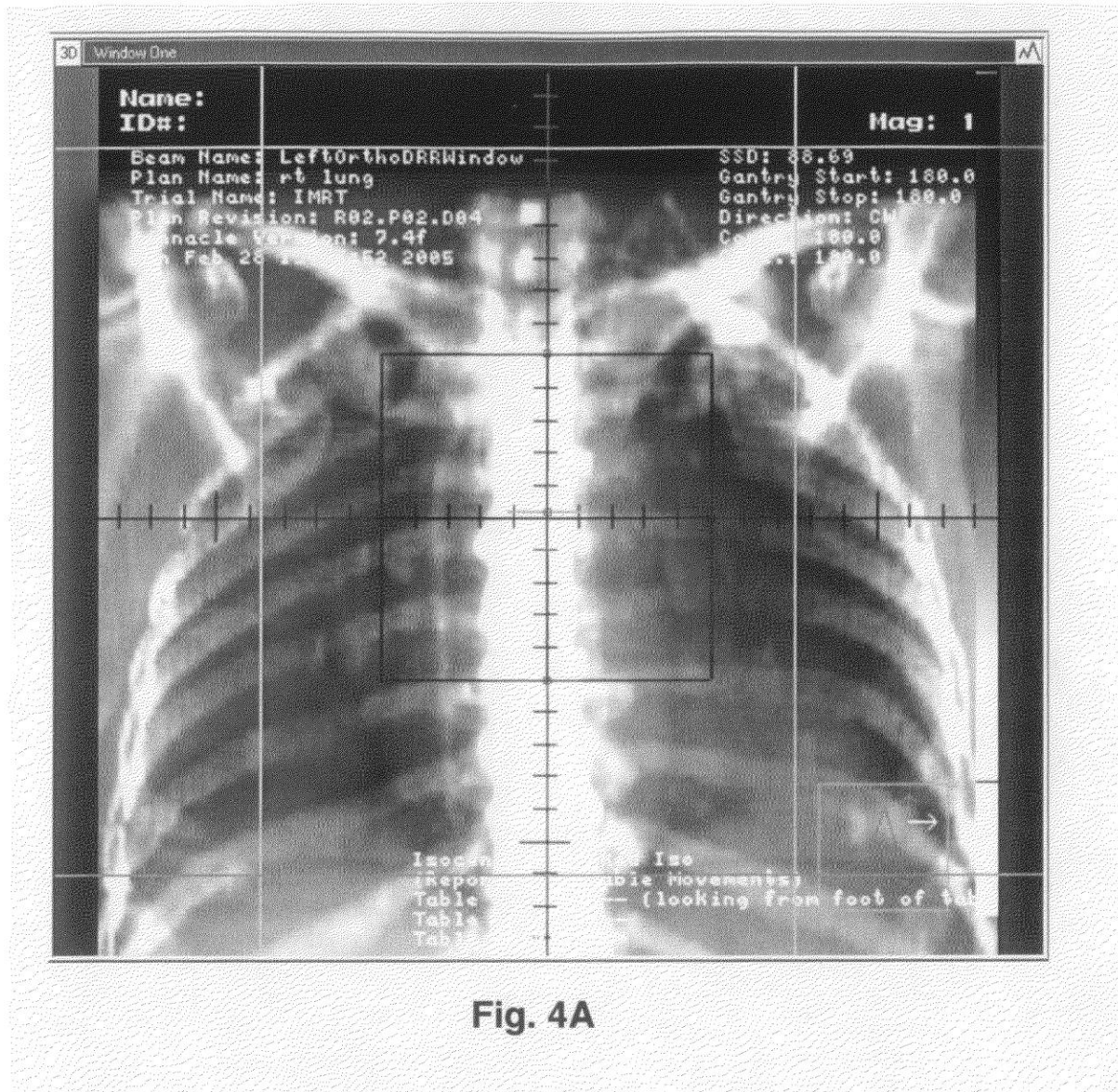
Stereotactic Radiotherapy (SRS/SBRT)

Intraoperative Radiation Therapy (IORT)

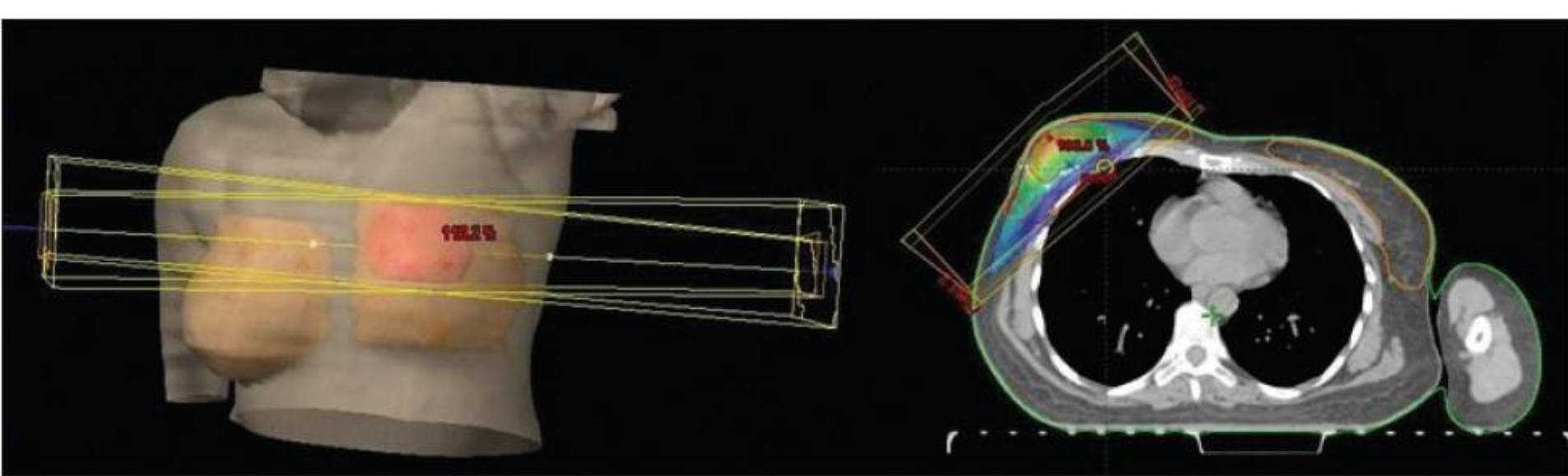
Brachytherapy (intracavity, interstitial)

Particle Beam Therapy

Two Dimensional RT (2D)



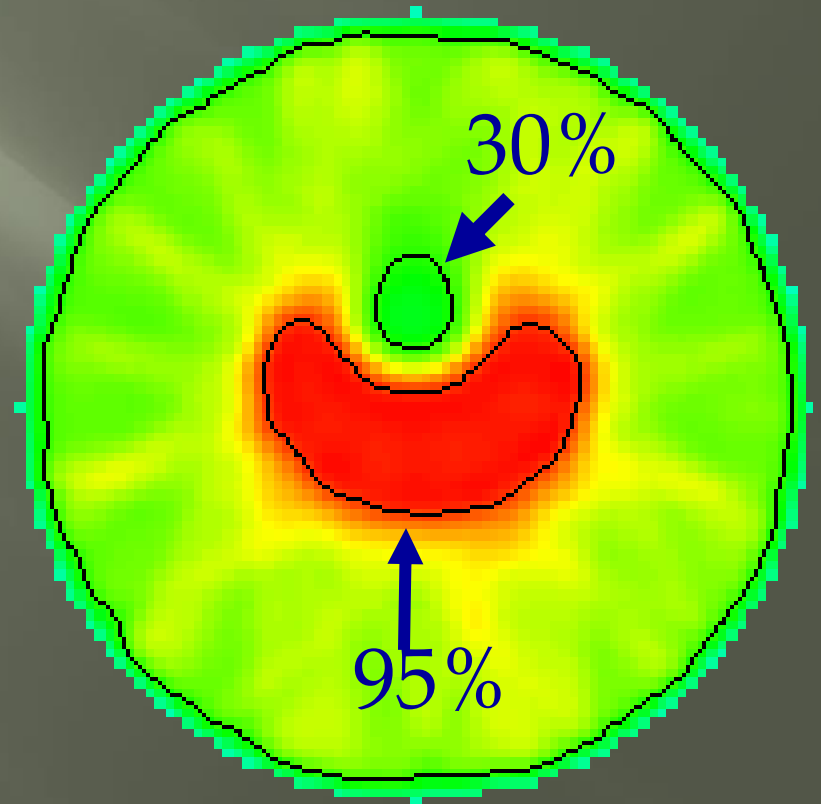
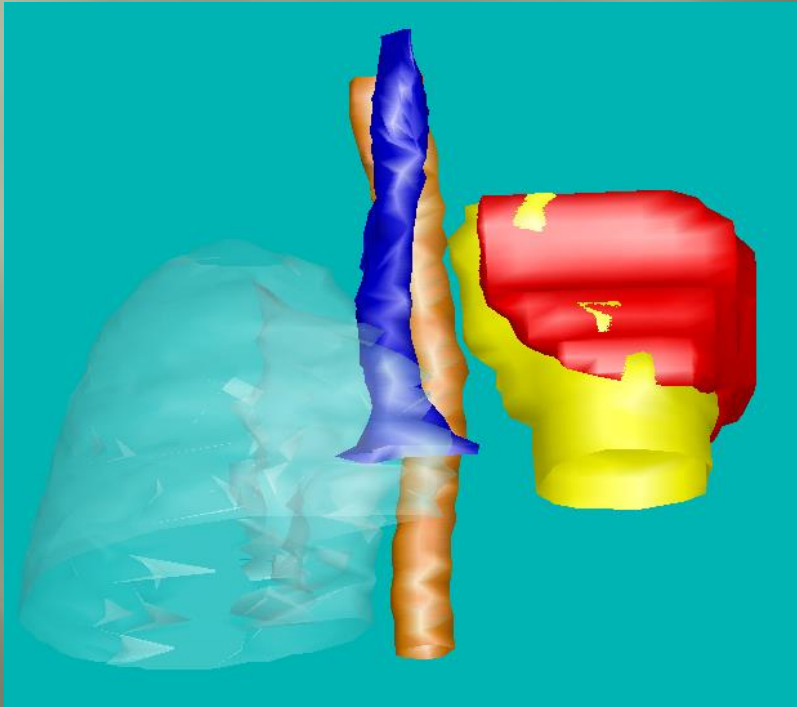
3D-CRT



- Utilizes 3D imaging in treatment planning (i.e. CT, MRI, PET)
- Allows radiation oncologist to target a structure and avoid nearby normal tissues
- Routine clinical use pioneered by our own Benedick Fraas, PhD

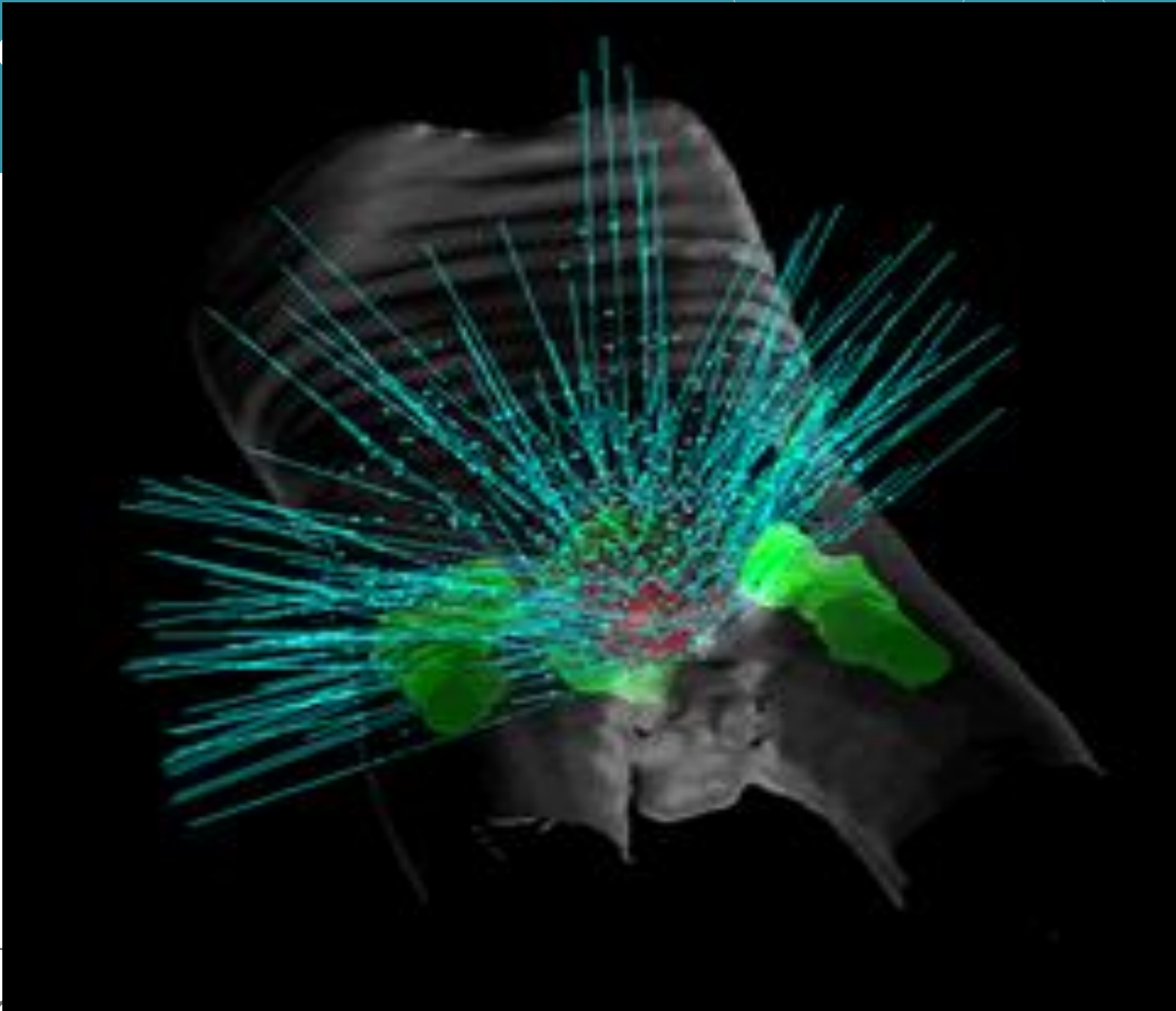
Beam Sculpting

Modern day computing and therapy hardware allows us to accurately exclude critical normal tissues



Stereotactic body Radiotherapy (SBRT) aka SABR







2004 10 21

Stereotactic Radiotherapy

- High doses in very few fractions (1-5 total)
- Similar to IMRT but requires imaging at treatment time
- Can be used to replace surgery in selected patients

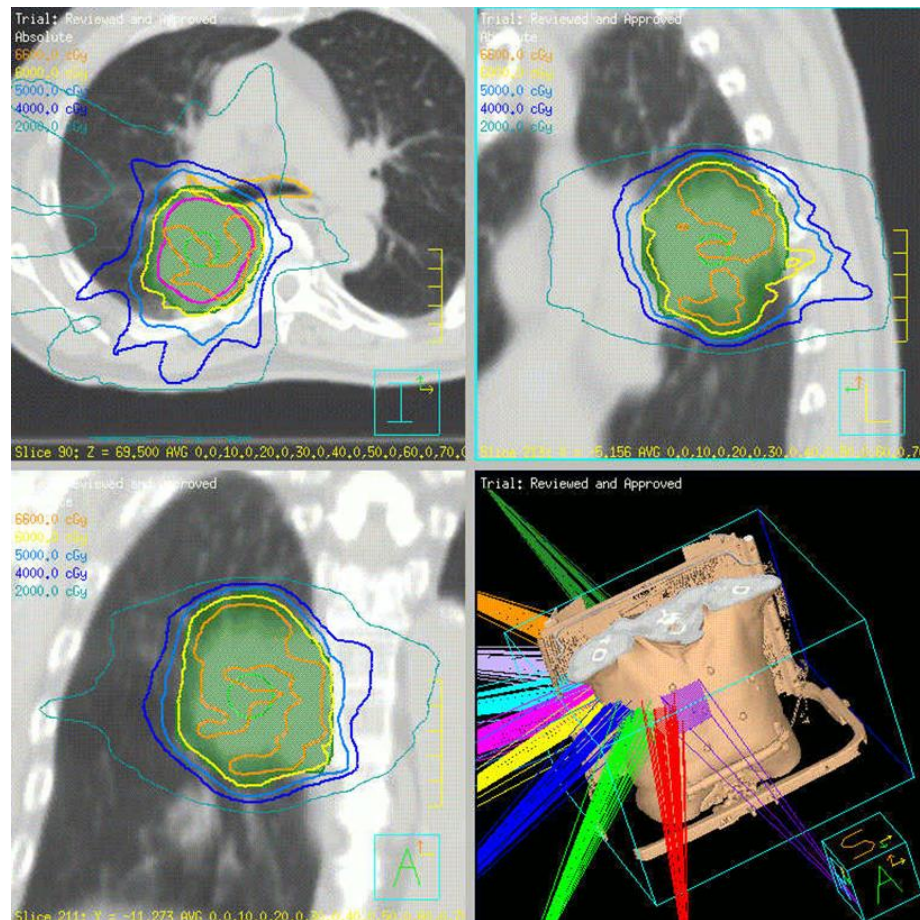
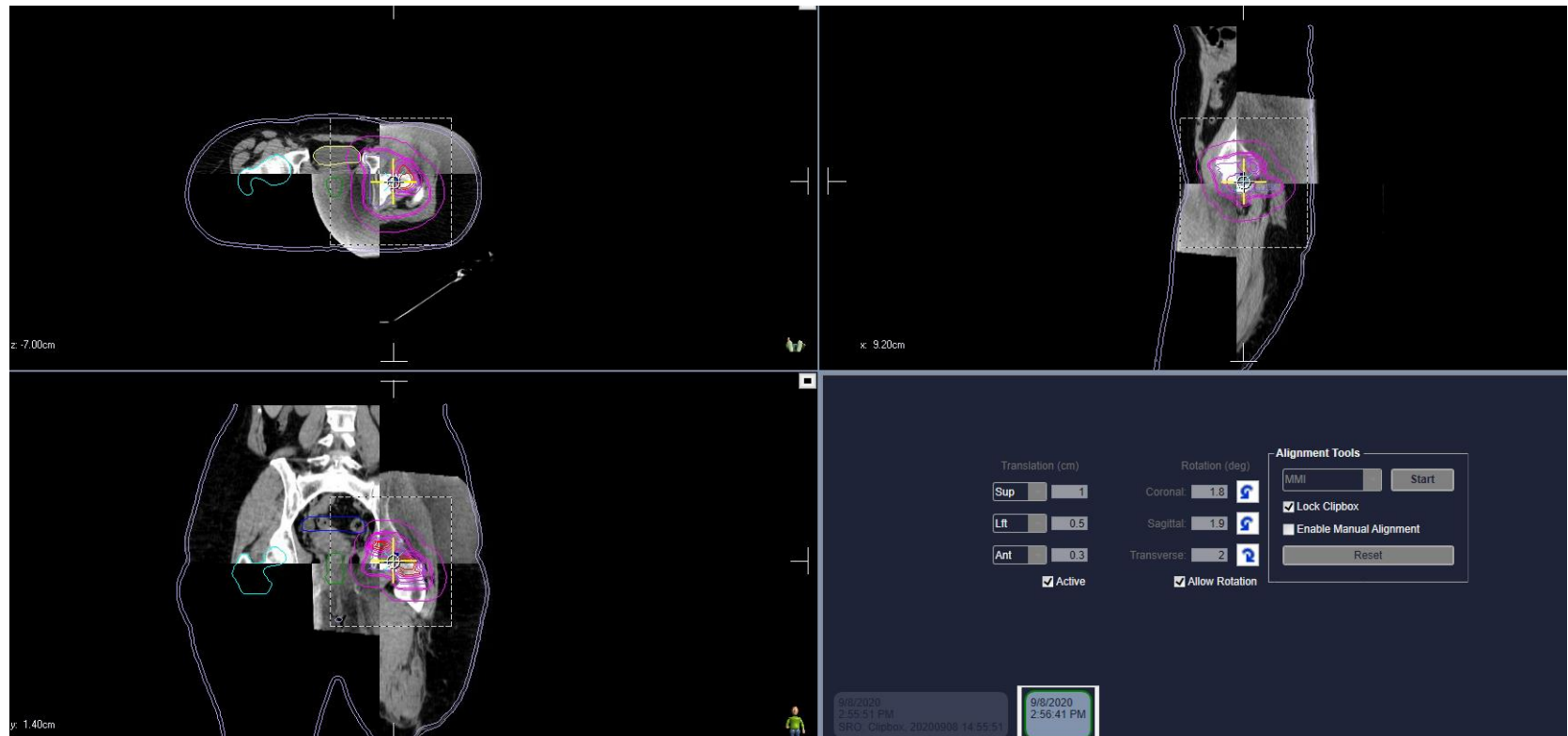


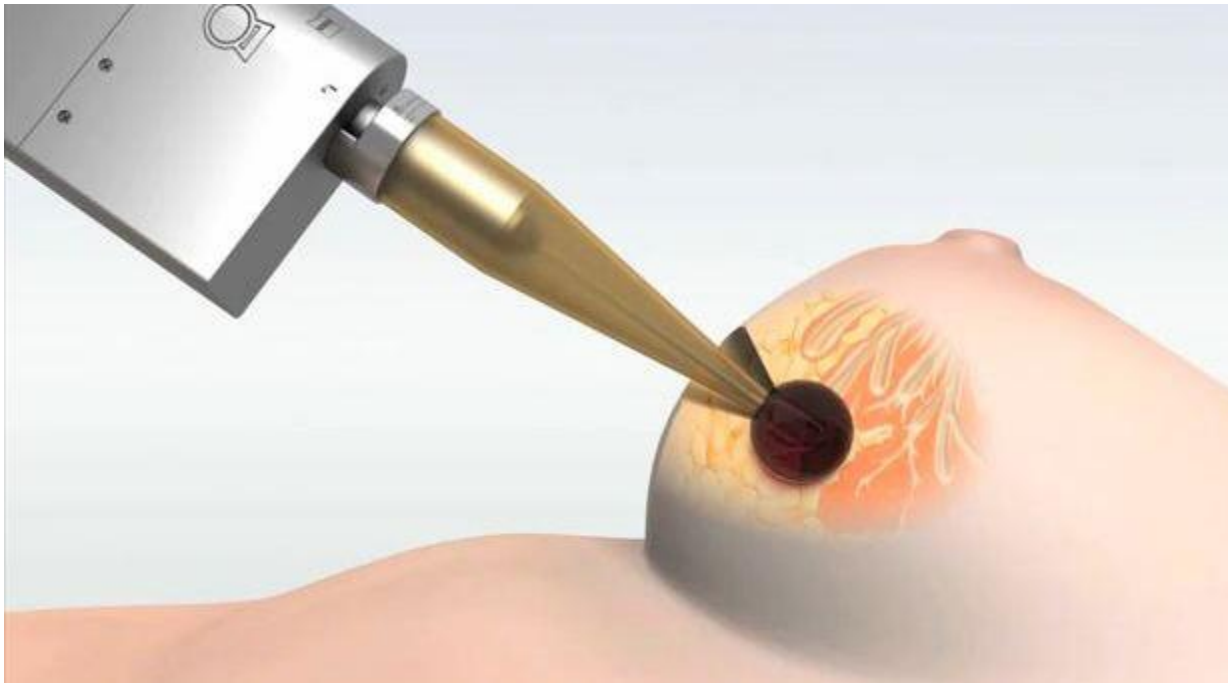


Image Guidance



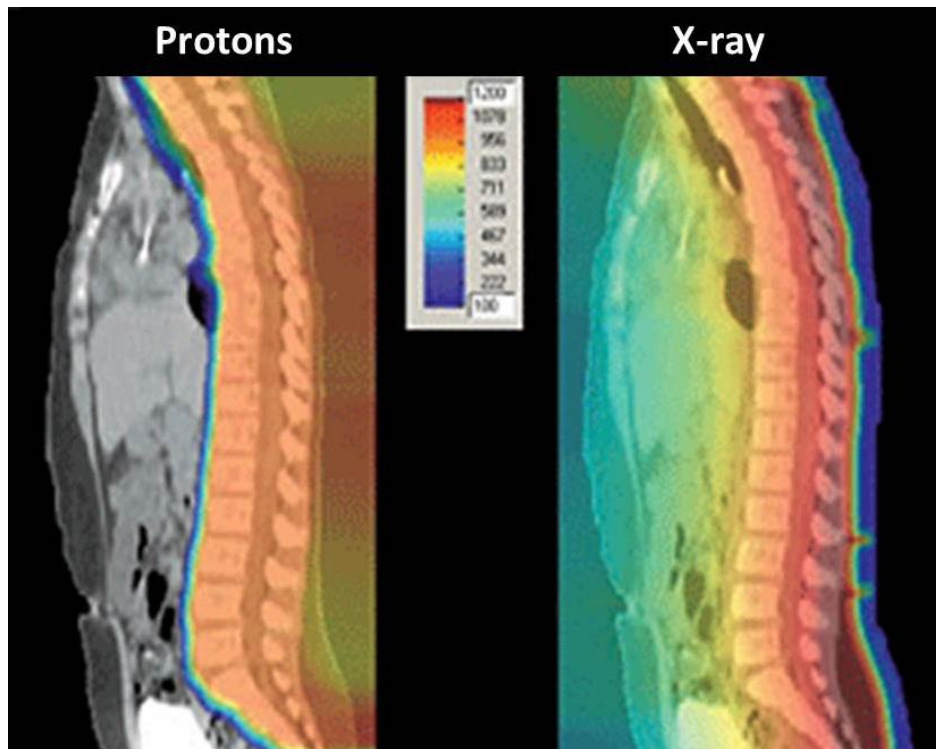
Intraoperative Radiotherapy (IORT)

- Radiation delivered in the operating room at the time of surgery
- Single treatment (one fraction)
- Limited indications including some early stage breast cancers

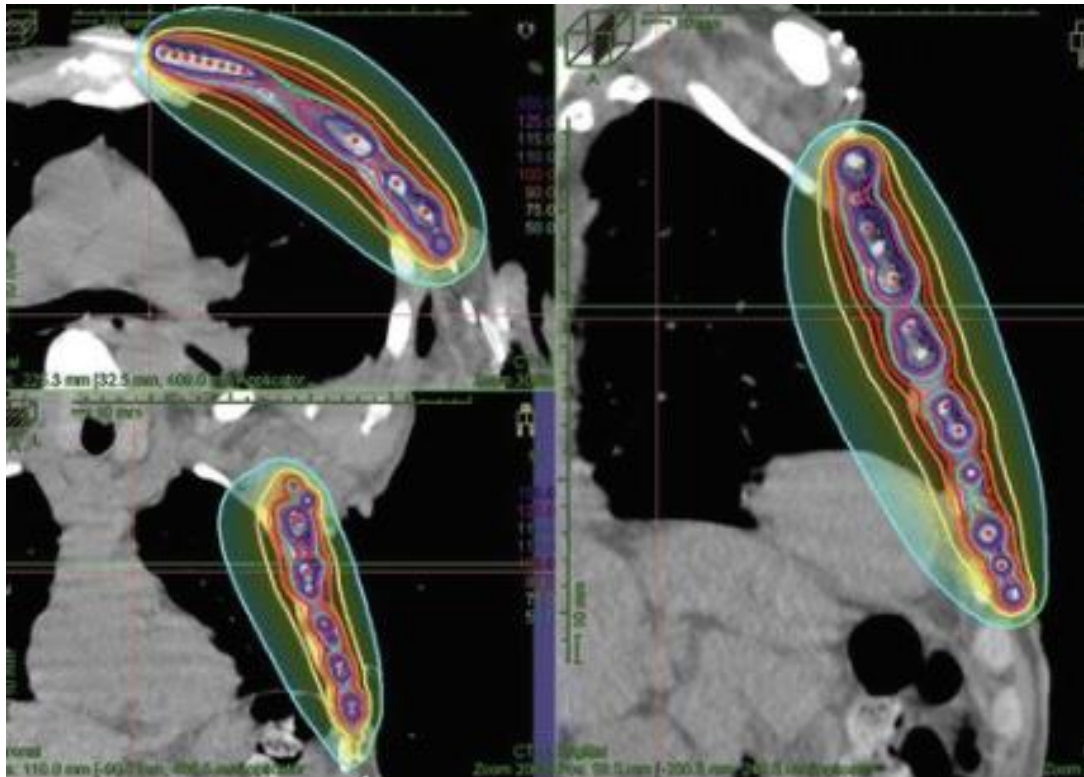


Proton Therapy

- Favorable physical characteristics compared to conventional photon therapy
- Very expensive
 - \$20M+ for single treatment room
 - \$100M+ for multi-room system
- Lack of clinical data to support broad use



Brachtherapy



Machines Used in Radiation Oncology

Linear accelerators (LINAC)

TrueBeam

Versa

Triology

Synergy

Precise

Cyberknife

Proton Beam (sharp shooting radiation)

Gamma Knife (strictly used for treatment of brain)

© Original Artist
Reproduction rights obtainable from
www.CartoonStock.com



Search ID: sea0175