

Radiation Oncology

An Introduction: How, When and Why

Margret Rogers, DVM (Residency trained in Radiation Oncology)

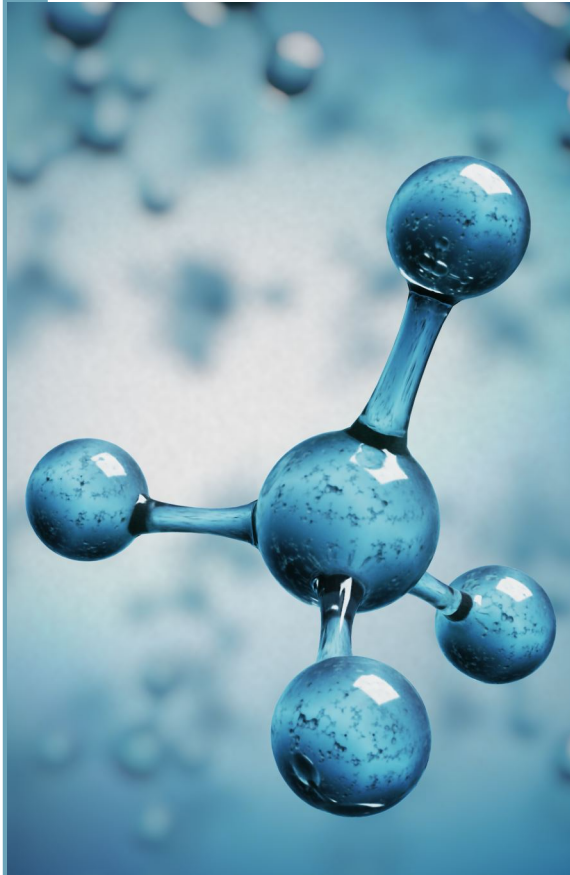


Radiation Oncology – Cats, Dogs and Physics

Clinical application of radiation

- **HOW** radiation therapy is implemented and the methods of administration
- **WHEN** radiation therapy is appropriate and common diseases and presentation of patients
- **WHY** use definitive protocols versus palliative (case reviews)

HOW?





Dogs, Cats and Physics

- Radiation for therapy is comprised of **photons or electrons**
 - Produced in a **Linear Accelerator**
 - Some use of Protons and possibly Carbon ions in the future
- Energies of photons differ from those used in imaging
 - MV energy versus KV energy

Types of Administration

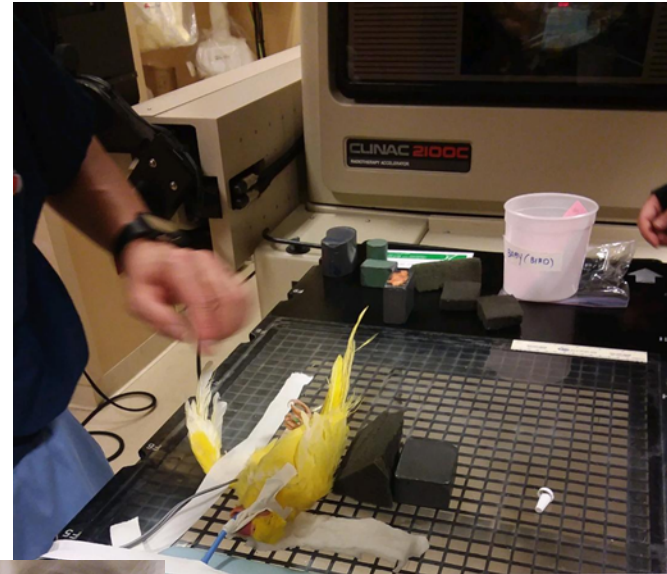
Manual

3DRT

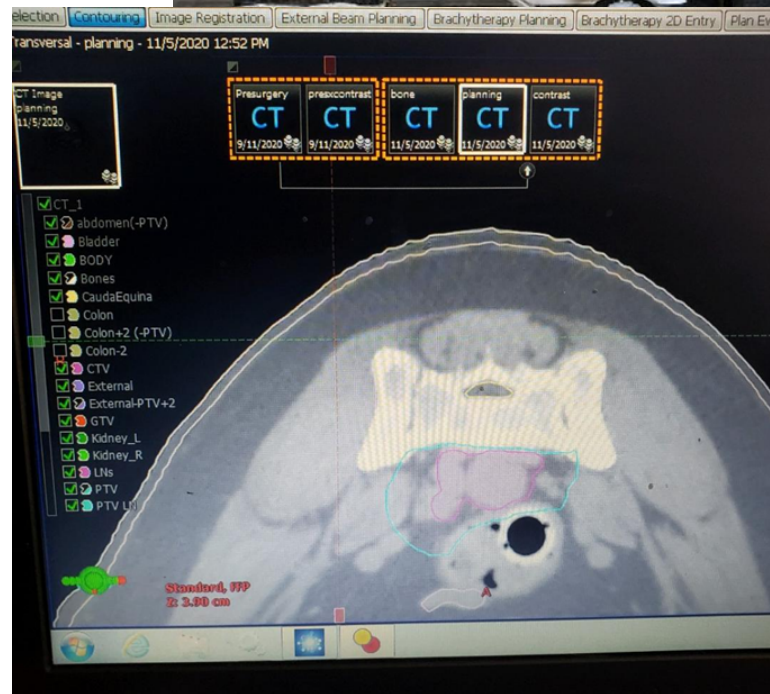
IMRT

- Stereotactic

MANUAL



3DRT

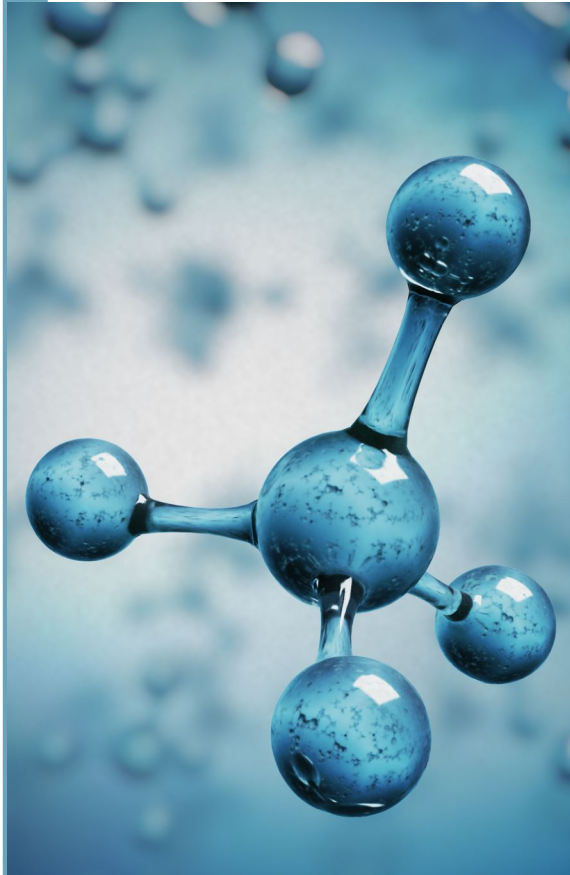


IMRT



Upper	0.0	0.0	28.00	40.95	60	x
Lower	245.3	100.0	28.00	6.87	60	x
<input checked="" type="checkbox"/> GTVp	101.8					
Upper	0.0	0.0	28.00	40.95	60	x
Lower	101.8	100.0	28.00	11.60	60	x
<input checked="" type="checkbox"/> PTV	289.2					
Upper	0.0	0.0	28.00	40.95	60	x
Lower	289.2	100.0	28.00	6.87	60	x
<input checked="" type="checkbox"/> Brains	95.6					
Upper	0.0	0.0	24.75	60		x
Upper	9.6	10.0	15.00	6.34	60	x
Upper	14.3	15.0	10.00	3.68	60	x
<input checked="" type="checkbox"/> Eye_L	3.3					
Upper	0.0	0.0	20.00	40.95	60	x
<input checked="" type="checkbox"/> Eye_R	7.6					
Upper	0.0	0.0	5.00	8.39	60	x
<input checked="" type="checkbox"/> Lens_R	0.6					
Upper	0.0	0.0	5.00	4.07	60	x
<input checked="" type="checkbox"/> Skin	559.0					

WHEN and WHY?



9/20/21

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Goals of Radiation

- **Tumor Control**
 - Microscopic disease
 - Gross disease
 - Concurrent with other modalities
- **Palliative**
 - Bone pain
 - Bleeding
 - Inflammation

Methods of Administration

- **Tumor Control**
 - Fractionated Protocols
 - SBRT, SRT
- **Palliative**
 - Hypofractionated

Fractionated Protocols

Total dose is broken into multiple tiny doses

Multiple Treatments is usually between 10 to 21

- Depends on the site and the type of cancer

3-5 treatments per week

Fractionated Protocols

Higher cumulative dose

- HIGHER DOSE TO THE TUMOR

Results in more acute side effects (fast dividing cells)

- Usually 1-2 weeks depending on severity

Limits late tissue effects to less than 5 %

- Vascular damage/scar tissue formation

Coarsely Fractionated Protocols

Fewer BUT larger doses

- Usually between 2 to 6 treatments

Typically, one treatment per week

Lower cumulative dose

LOWER DOSE TO THE TUMOR

Coarsely Fractionated Protocols

Results in less acute side effects

- Usually limited to hair loss and pigmentation

Increased risk of late tissue effects: 10-30% (dependent on dose)

Complications: expressed late tissue effects

SRT, SBRT Protocols

Definitive Therapy

3-5 treatments – over a
shortened period

Treatment of the tumor
without prescribed margins

- Must have gross disease present
 - Examples: Brain and Nasal

Historically – was designed
for brain tumors

- Designed by a neurosurgeon

Acute Side Effects



Affect rapidly growing tissues

- Desquamation
- Mucositis
- Colitis
- Rhinitis

Late Side Effects



6 months to 2 years after radiation

- Necrosis
- Fibrosis
- Secondary Cancers

Common Clinically Treated Tumors

- STS
- Nasal Tumors
- Brain Tumors
- MCT
- AGASACA
- TCC
- Oral Tumors
- OSA



Case 1: Beckett

- 7 yr old, MN Lab Mix
- low grade incompletely excised MCT – medial aspect of the L elbow (Mitotic count = 0)
- Therapy? (Fractionated – Coarsely Fractionated – SBRT)
- MCT are very radiosensitive
- Young dog
- Financial concerns

Beckett

- Fractionated Protocol
- Manual radiation (4 Gy x 10 fractions = 40 Gy)
- Almost one year out – no signs of late side effects
- No evidence of recurrence



Case 2: Lola

- 9 yr old, FS Retriever mix
- Firmly attached thyroid tumor
 - thyroid carcinoma with metastatic disease



Lola

Referral hospital recommended
no therapy and euthanasia

Second Opinion.....what
can we do?

Therapy? (Fractionated –
Coarsely Fractionated – SBRT)

Lola

SBRT: 10 Gy x 3 treatments = 30 Gy

Owned by a Medical Oncology Resident

- Carboplatin : neutropenia
- Palladia: 1 year
- No therapy currently

Two years post RT, static locally/progressive thoracic mets



Case 3: Phineas

- 10 yr old MN, Yorkshire Terrier
- Narrowly excised AGASACA (Sept 2018)
- Recurrence noted June 2019
 - Hypercalcemia
 - Obstipation
 - Medial iliac lymphadenopathy

Case 3: Phineas



- Therapy
 - Fractionated, Coarsely Fractionated or SBRT?

Case 3: Phineas

Coarsely Fractionated: 6 Gy x 6
treatments = 36 Gy

Emergent MANUAL treatment

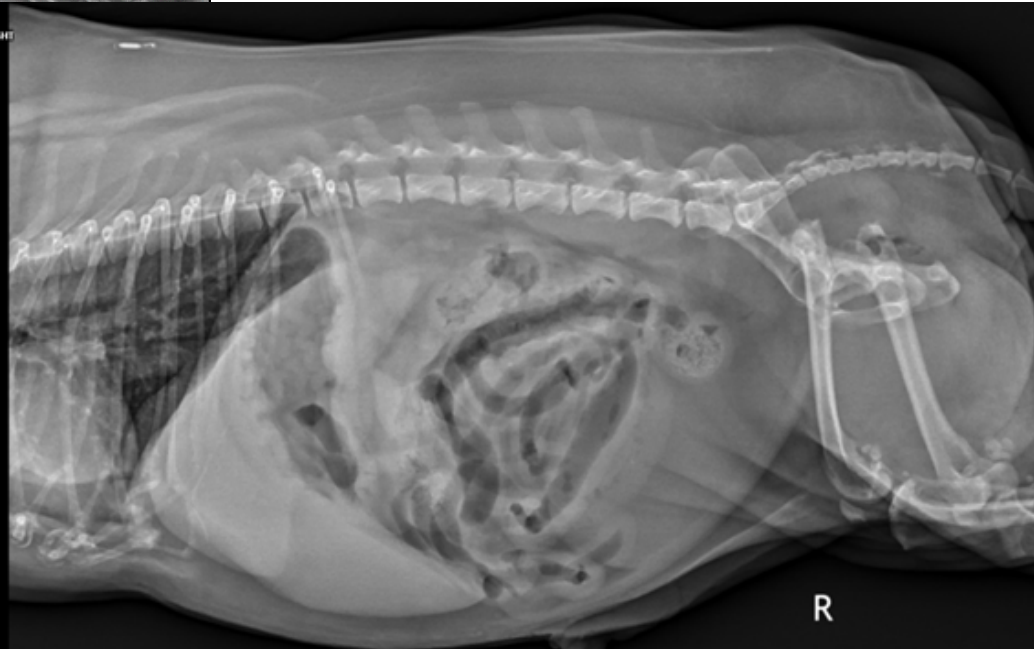
IMRT planning immediately after 2nd
treatment

Finished on 9/12/19

Case 3: Phineas



Name: P
Id: 11134
Owner: P
Institution
Study Da
Acq Time





Case 4: Mabel

- 5 yr old, FS Cockapoo
- Left perianal grade III STS
- Mitotic Count - 36

- Therapy?

- Fractionated
- Coarsely Fractionated
- SBRT



Case 4: Mabel

- Coarsely Fractionated
- 6 Gy x 6 treatments = 36 Gy
- Staging planned at three-month intervals



QUESTIONS?

margret.rogers@medvet.com