# Radiation for head and neck tumours

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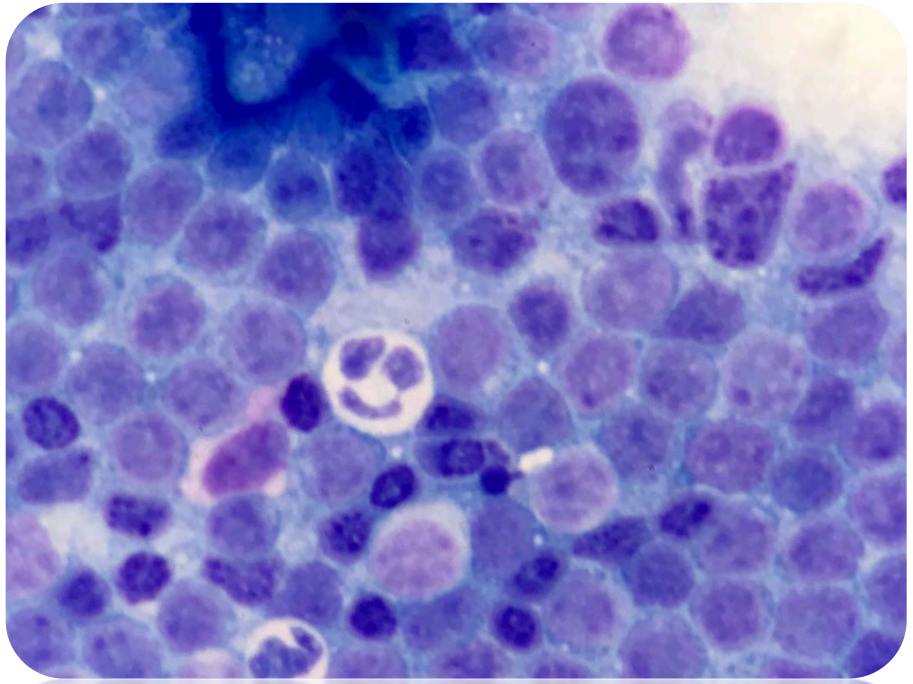
sash+
Small Animal Specialist Hospital



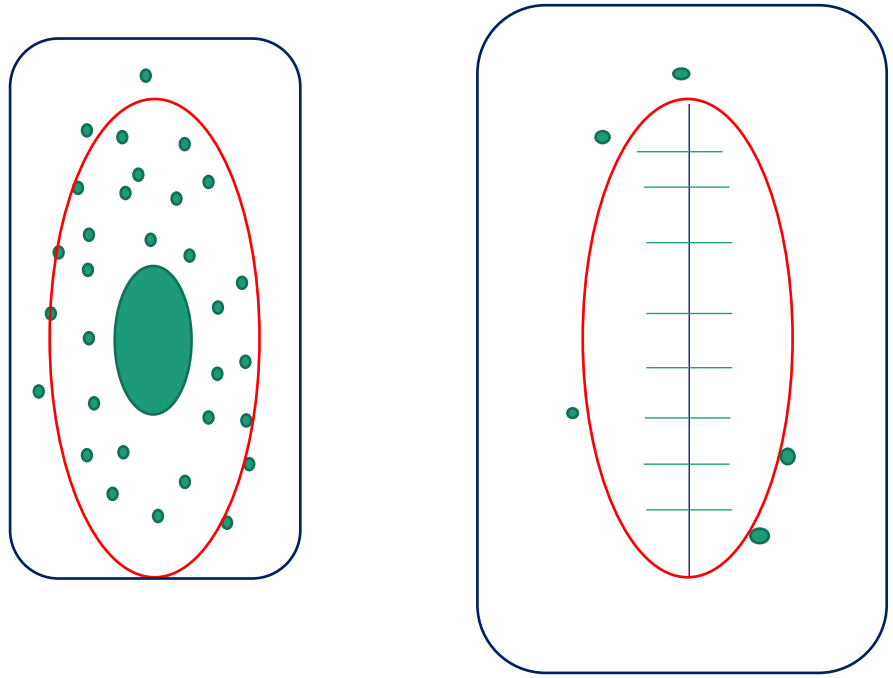
# Outline

- Radiation in relation to surgery
- Neck case examples
- Sinonasal case examples
- CNS case examples

# Pre-op RT - why

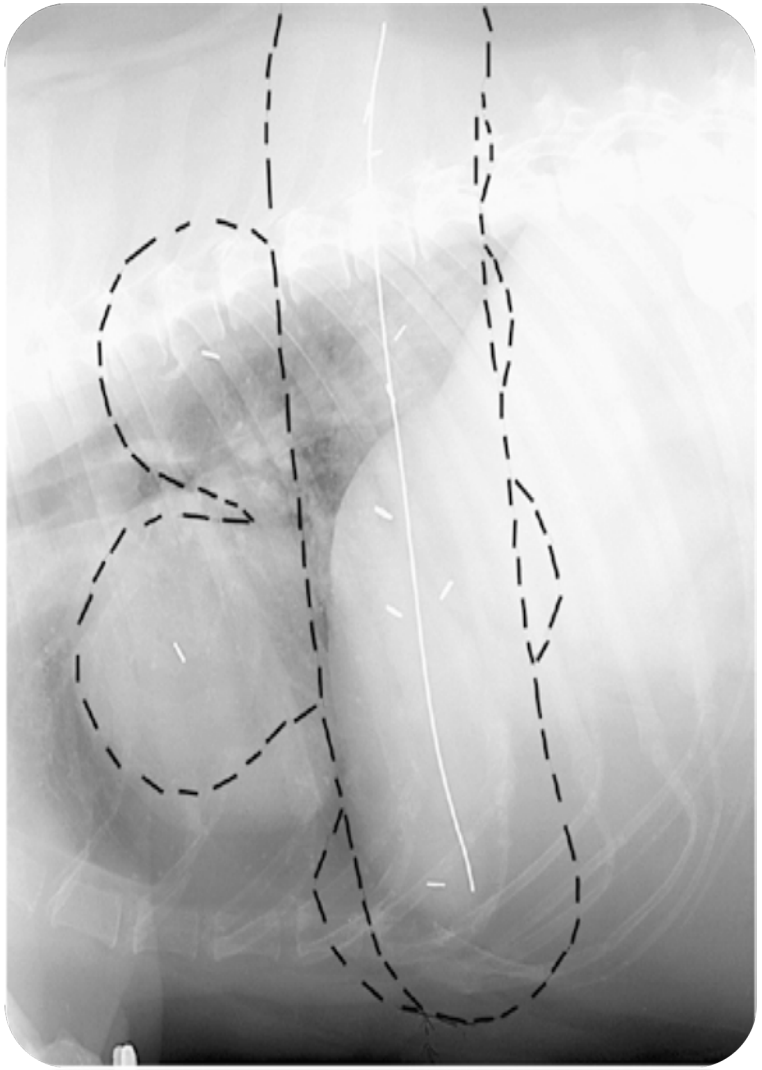
- Some generalisations:

- Some tumours can’t be excised
- Radiation field is SMALLER pre-op
- Tissue is better oxygenated
- Surgery might not be needed post-RT
  - E.g. CNS or complete response



# Post-op RT – why

- Surgery was incomplete
  - Still requires planning
- RT effective against local microscopic disease
- RT damages fibroblasts/endothelial cells
  - If pre-op, RT impairs wound healing
- RT might not be needed
  - Complete margin evaluation



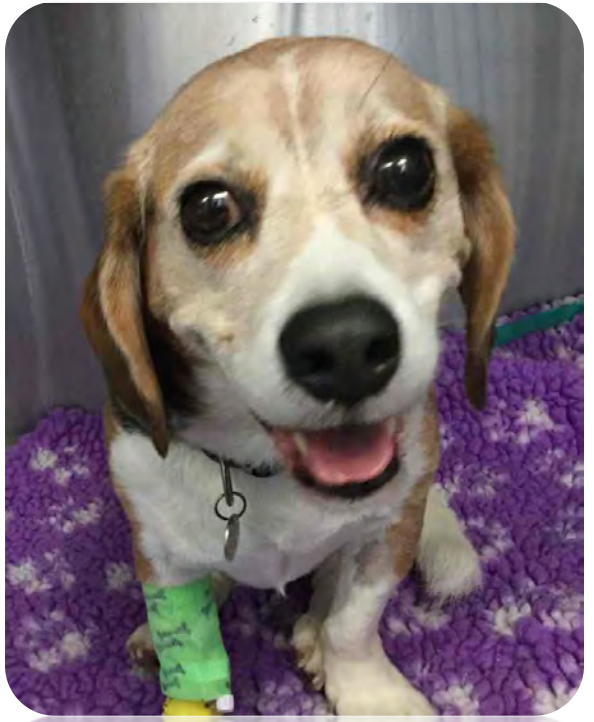
# Neck

# Case 1 – Polar

- Signalment
  - 9 yo MN beagle

- History
  - Presented to ophthalmology service
  - Left sided horners
  - Left sided pigmented iridial mass and increased IOP (melanoma on histopath)

  - Incidental right sided neck mass



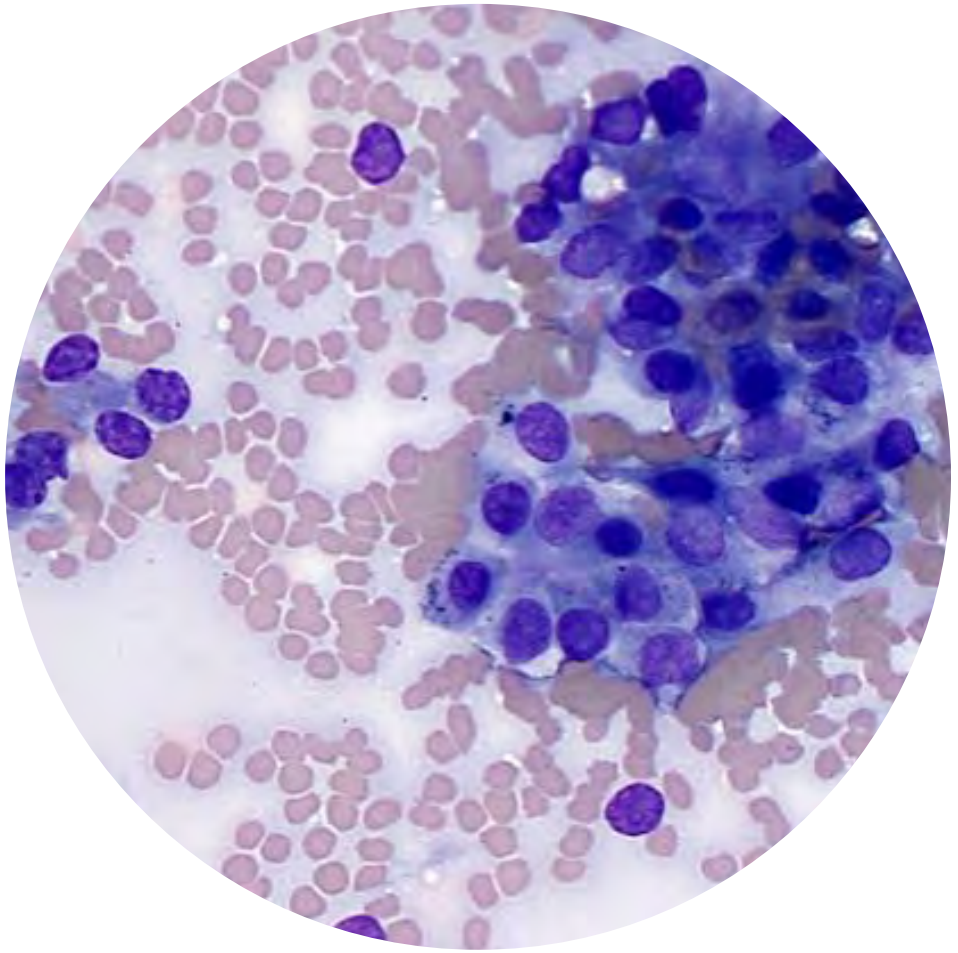
# Differentials

- Mass
  - Infectious
    - Abscess
  - Neoplastic
    - Lymph node (e.g. lymphoma, tonsillar squame)
    - Thyroid carcinoma
    - Chemodectoma (carotid)
  - Other
    - Sialocoele

# Polar – Computed Tomography

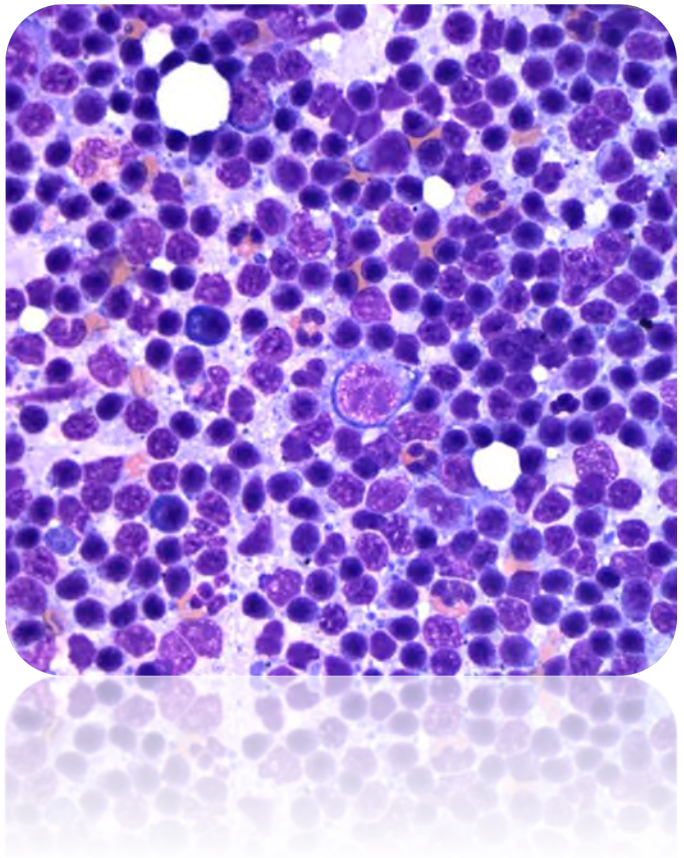
# Sampling

- Fine needle aspirate
  - Free nuclei, clusters of cuboidal epithelial cells, amorphous eosinophilic material.
- Biopsy?
- Presumption?



# Staging

- Thoracic radiographs + abdominal ultrasound
  - 35-40% at diagnosis, 80% eventually
  - Skip mets
- Three-dimensional imaging
  - CT + iohexol (care with iodine)
- Lymph node aspiration
  - Which nodes?



# Treatment options?

- Surgery
  - Tristram covered this…
  - Non-mobile lesion…

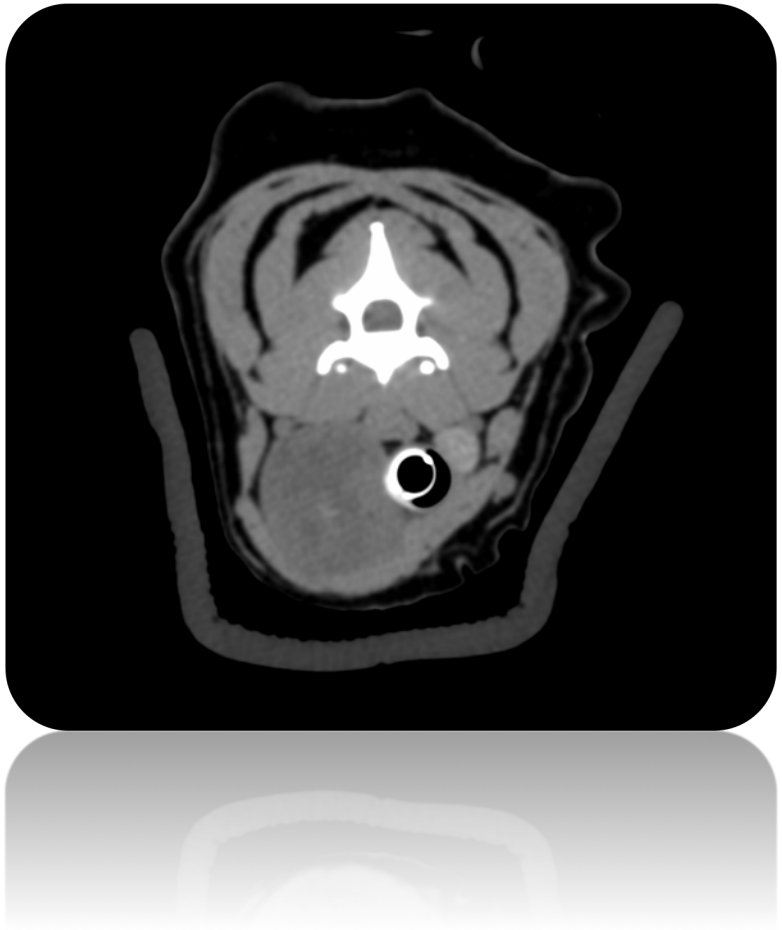
- Radioactive iodine $I^{131}$
  - Common misconceptions
    - Functionality ~10% hyperthyroid
  - Hospitalization ~ 7-14 days
  - Myelosuppression
  - MST ~2 yrs

# Treatment options

- External beam radiation
  - Able to treat every lymph node

- Palliative/hypofractionated
  - 4 Fx X 8-9 Gy weekly
  - MST 6 months – 2 yrs

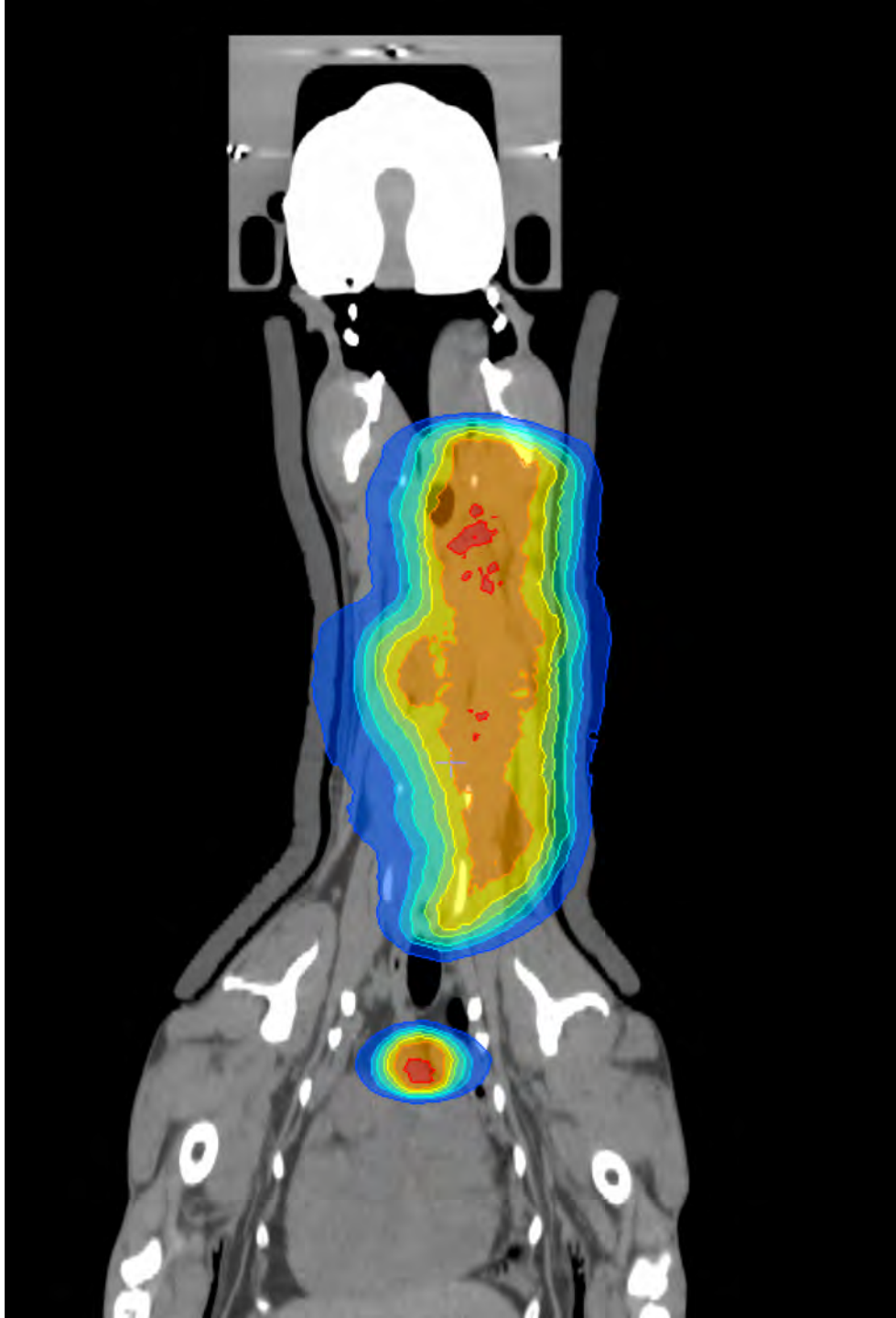
  - Mild acute side effects
  - Minimal long-term side effects



# Treatment options

- Definitive
  - 18-20 Fx X 2.5-2.67 Gy
  - MST 24 months
  - PFS 80% at 1 year and 72% at 3 years
  - 8 – 22 months for maximal response

  - “Itises”
    - Pharyngitis, esophagitis, tracheitis
    - Low risk of long-term side effects
    - Hypothyroidism



# Polar – outcome

- Repeat CT at 6 months
  - Decreased primary tumour size
    - No metastatic disease
    - Could the lesion now be resected?
- 12 months
  - Acute onset neurological signs
  - Suspected complex partial seizures
  - Levetiracetam
  - Still feeling great…

# Sinonasals

# Case 2 – Milo

- Signalment
  - 7 yo MN Border Collie

# History

- Right periocular swelling, single episode mild epistaxis
  - Ophthalmology – right eye ulcer, suspected retrobulbar cellulitis
    - Opticin, polyvisc, carprofen, cephalexin

- Moderate response

# Examination

- BAR
- Sclera white OU, normal tear film
  - OD ulcer resolved, periocular swelling reduced, still present
- Nasal airflow reduced RHS
- Oral exam normal
- Peripheral lymph nodes normal

# Differentials (reduced airflow, swelling, epistaxis)

- **V**ascular – rodenticides/clotting disorders
- **I**nfectious/inflammatory – Fungal rhinitis, allergic rhinitis, nasal mites, periodontal disease/abscess
- **T**raumatic – HBC, foreign body
- **A**llergic – lymphoplasmocytic rhinitis
- **M**etabolic – systemic hypertension
- **I**diopathic – lymphoplasmacytic rhinitis
- **N**eoplastic – carcinoma, sarcoma, lymphoma others
- **D**egenerative

# Diagnostics - Imaging

| | **Rhinoscopy** | **Radiographs** | **Computed Tomography** |
|---|---|---|---|
| PROs | Direct visualization – plaques, bone destruction, foreign material, obtain biopsy, retroflex | Readily available, dental units… | Best imaging detail/information, can be used to plan sampling or therapy |
| CONs | Mass may fill cavity, hemorrhage obscures view | Limited utility due to superimposition | Cost |

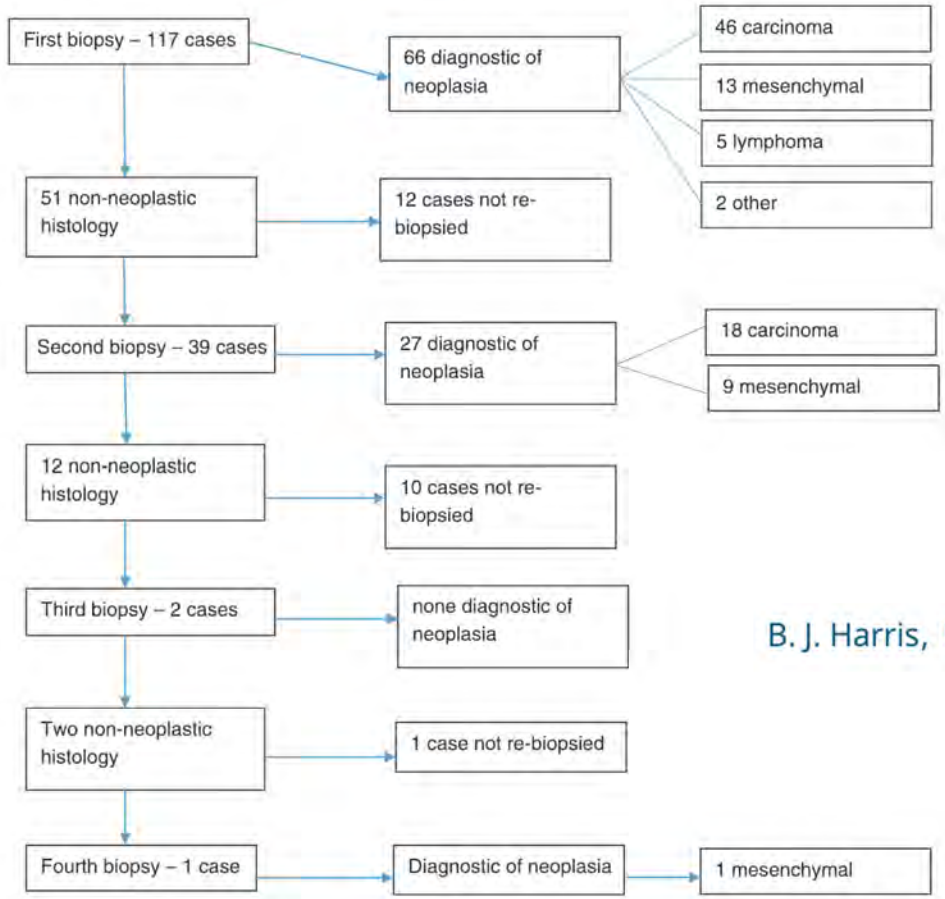
# Diagnostics - Sampling

- Serology – LCAT, aspergillus
- Cytology
- Fungal/bacterial culture
- Biopsy
- Lavage

# Biopsy techniques

# Lavage

# Which biopsy is best?




B. J. Harris, B. N. Lourenço, J. M. Dobson, M. E. Herrtage

# Diagnosis

- Chondrosarcoma – stage 3
  - Carcinoma >> sarcoma >> rounds cell/other
  - Metastatic rate 10-24% at diagnosis
    - Stage I – confined to one nasal passage, sinus, with no bone involvement beyond turbinates
    - Stage II – Any bone beyond turbinates, no orbital, SQ involvment
    - Stage III – SQ, orbital, nasopharyngeal
    - Stage IV – lysis of cribriform plate
  - Systemic staging = aspiration bilateral mandibular nodes, thoracic radiographs/CT

# Therapeutic options

- NSAIDs/Antibiotics/Symptomatic = 3 months (>> if no epistaxis)

- Surgery = 3-6 months
  - Post RT surgery, 18 – 47 months

# Radiation Therapy

- Definitive
  - 10 daily treatments
  - Acute side effects mild but **common** (dermatitis, mucositis, reduced tear production)
  - Low risk of long term side effects
  - Survival 12-19 months

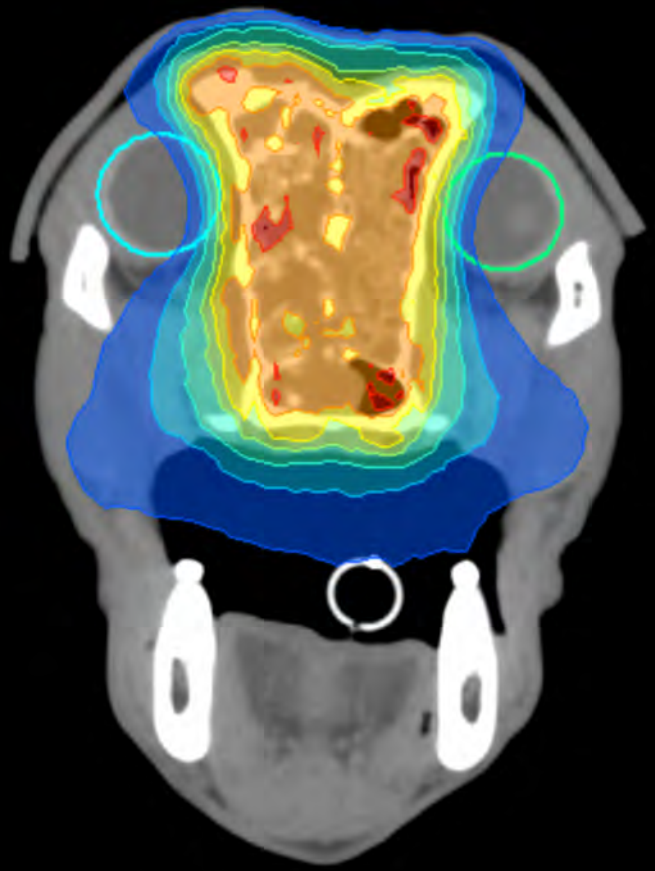
- Palliative
  - 5 daily or 4 weekly treatments
  - Acute side effects mild and **uncommon** (dermatitis, mucositis, reduced tear production)
  - Low risk of long term side effects
  - Survival 4-10 months

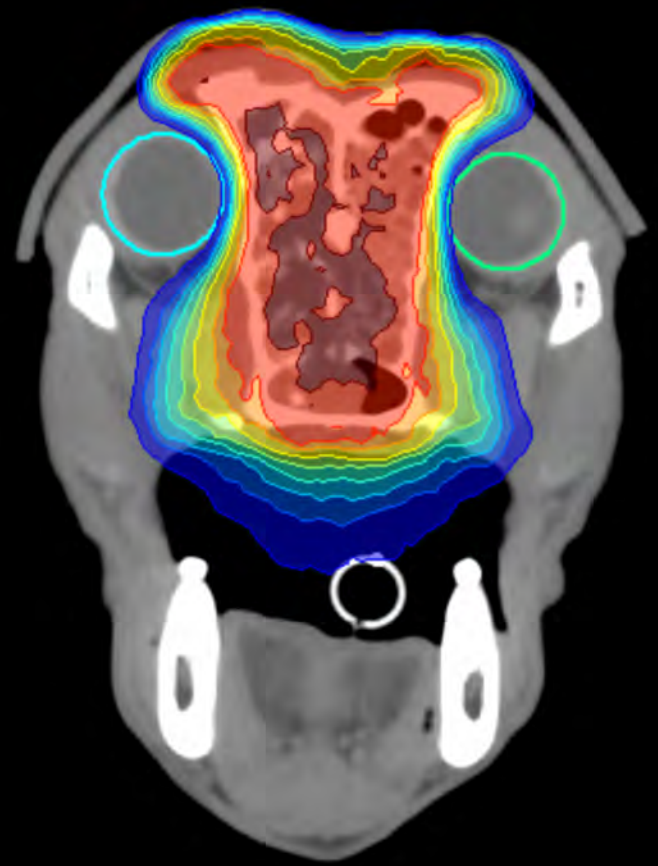
# Stereotactic

- Newer delivery technique – LARGE DOSE PER TREATMENT, FEW SESSIONS

- Highly conformal – miss the normal tissues
- Limited acute side effects (dermatitis, mucositis, reduced tear production)
- 10% risk of long term side effects (e.g. fistula)
- Survival 13-18 months

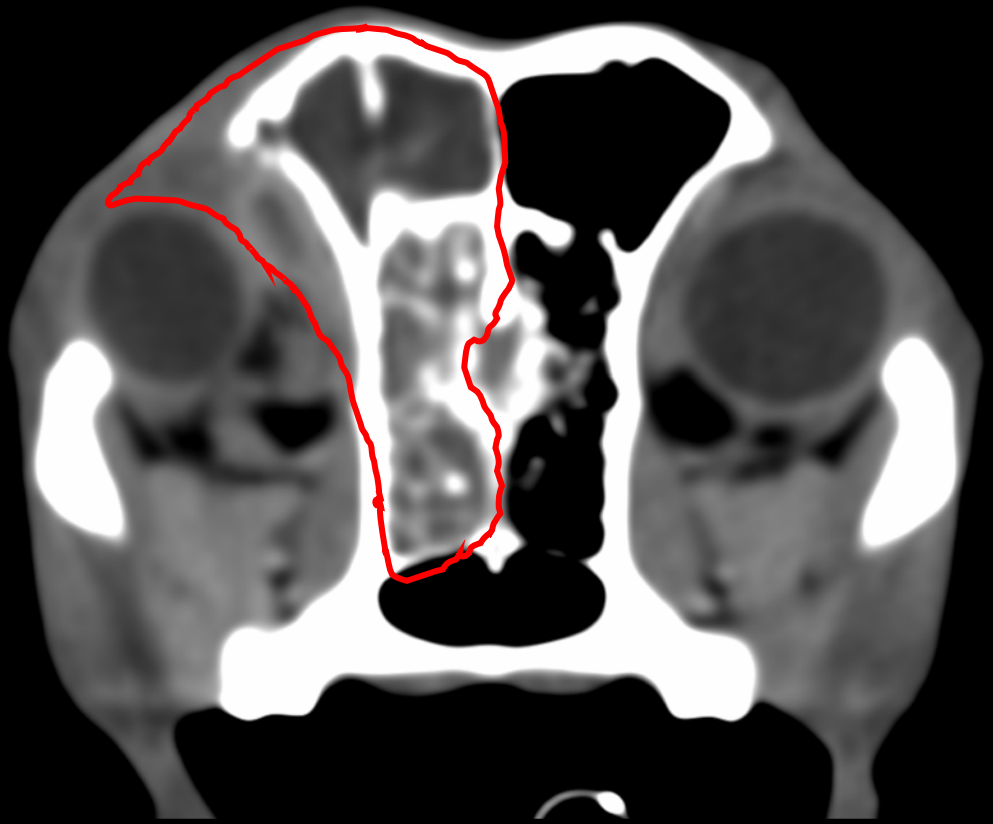
# Comparison



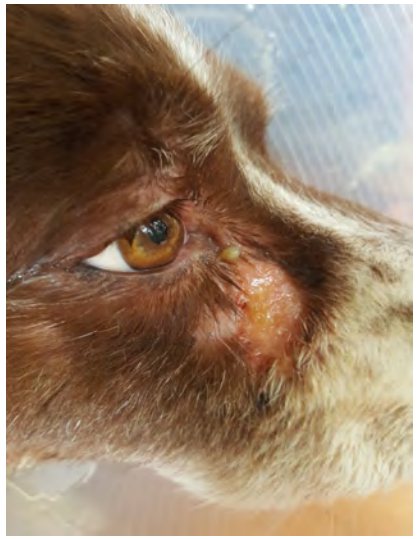


Which is the
better treatment?

# Side effects

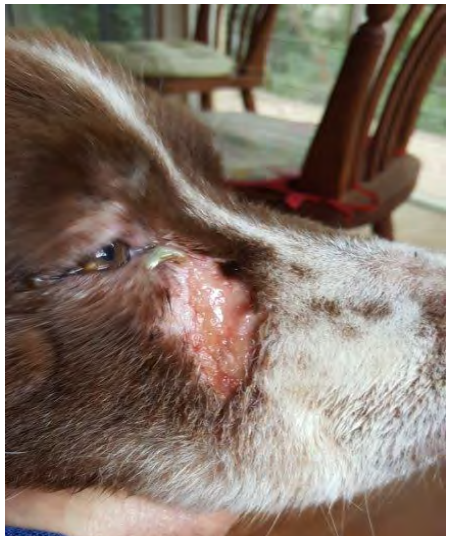


# Side effects – Milo



3 days

1 week

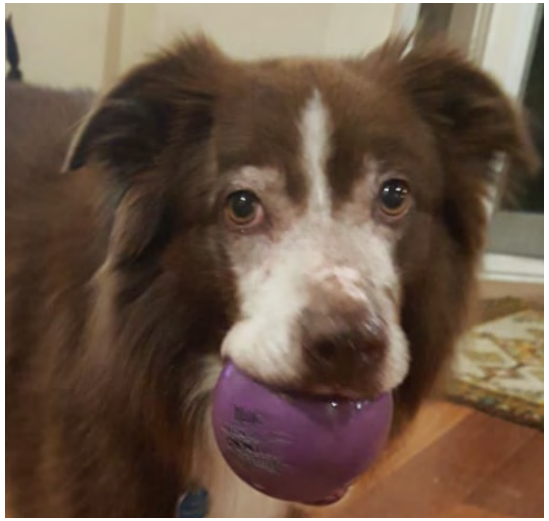


1 week

# Side effects

2 weeks

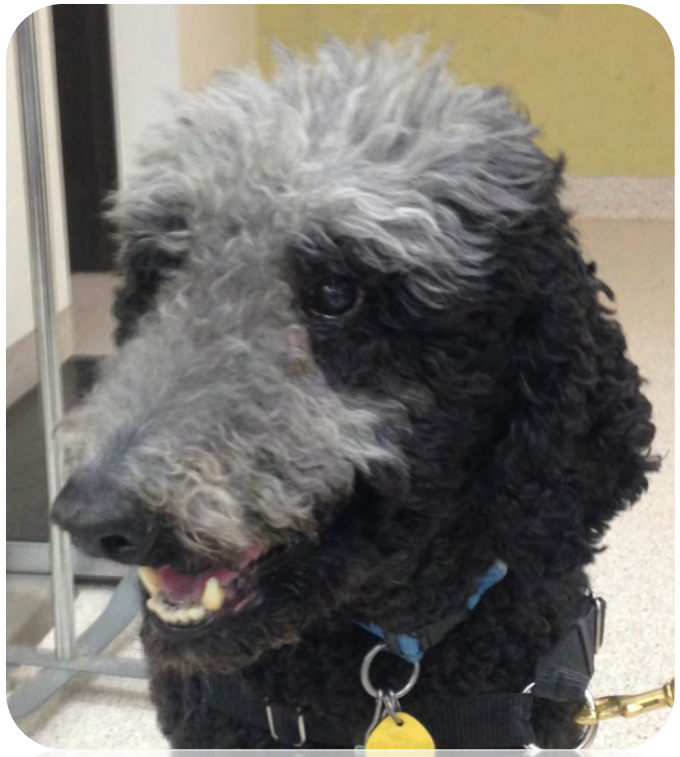
2 weeks



3 weeks

6 months

# No subcutaneous involvement



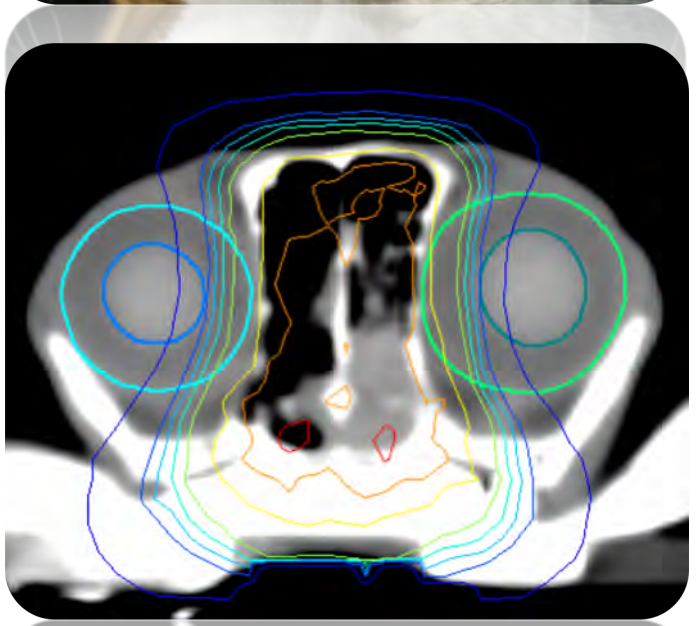
# Options Post Recurrence

- Milo = 10 months recurrence of clinical signs
  - Re-irradiate? Definitive/palliative
  - Chemotherapy?
  - Surgery?

# Cats

- Lymphoma > Carcinoma > Sarcoma

- Prognosis
  - Lymphoma
    - Radiation therapy, 18 – 30 months
    - Chemotherapy 5 months vs. 24 months if complete response
  - Carcinoma
    - Radiation therapy 12-14 months

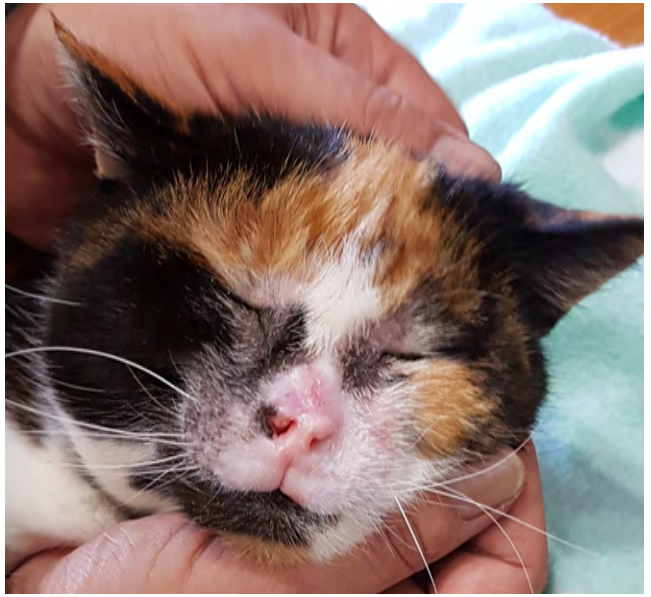


# Nasal planum SCC - Early

- Surgery, Plesiotherapy, Cryotherapy
- Sr-90 is a radioactive isotope that emits beta particles (electrons)
- Shallow penetration (2-3 mm)
  - > 100 Gy single treatment
  - PFS 56 months, 20% recurrence

# Nasal planum SCC - Late

- External beam radiation
  - Definitive 10 x 4.8 Gy



# CNS

# Case 3 – Felix – cats get CNS cancer too!

- Signalment
  - 13 yo MN DSH
- History
  - Long term IBD vs. GI Lymphoma
    - Pred/chlorambucil
    - December 2018 – thinning hair coat, aimlessly wandering, difficulty navigating

# Examination

- BCS 3/9
- Poor haircoat
  - UTD, parasite treatments, no excoriations
- Grade III heart murmur

# Differentials (obtundation)

- **V**ascular – rodenticides/clotting disorders
- **I**nfectious/inflammatory – Fungal disease, Toxoplasma, MUO, bacterial meningitis
- **T**raumatic – HBC
- **A**llergic –
- **M**etabolic – systemic hypertension
- **I**diopathic –
- **N**eoplastic – meningioma, lymphoma, pituitary, other
- **D**egenerative

# Diagnostics

- CBC and biochemistry
  - WNL (inc glucose), T4 normal, USG 1.017
- Echocardiography
  - Moderate to severe HCM with SAM
  - Systolic BP normal
    - Atenolol
- Abdominal ultrasound
  - Patchy pancreas, mild bilateral adenomegaly
- CT
  - Normal thorax
  - Head

# CT

IGF-1 normal

# Diagnosis for Felix?

- Pituitary neoplasia
  - *About 25% of diabetic cats have pituitary lesion!!*
- Not acromegalic
  - IGF-1 normal, not diabetic
- Possibly hyperadrenocorticoid
  - Clinical signs not consistent
  - Do we investigate further…?
    - Medical management (even IF Cushings diagnosed) unlikely to improve neuro signs

# Treatment options

- Surgical excision?
  - Likely subtotal
  - Anesthesia
    - Concurrent disease, mortality 8% within 24 hours

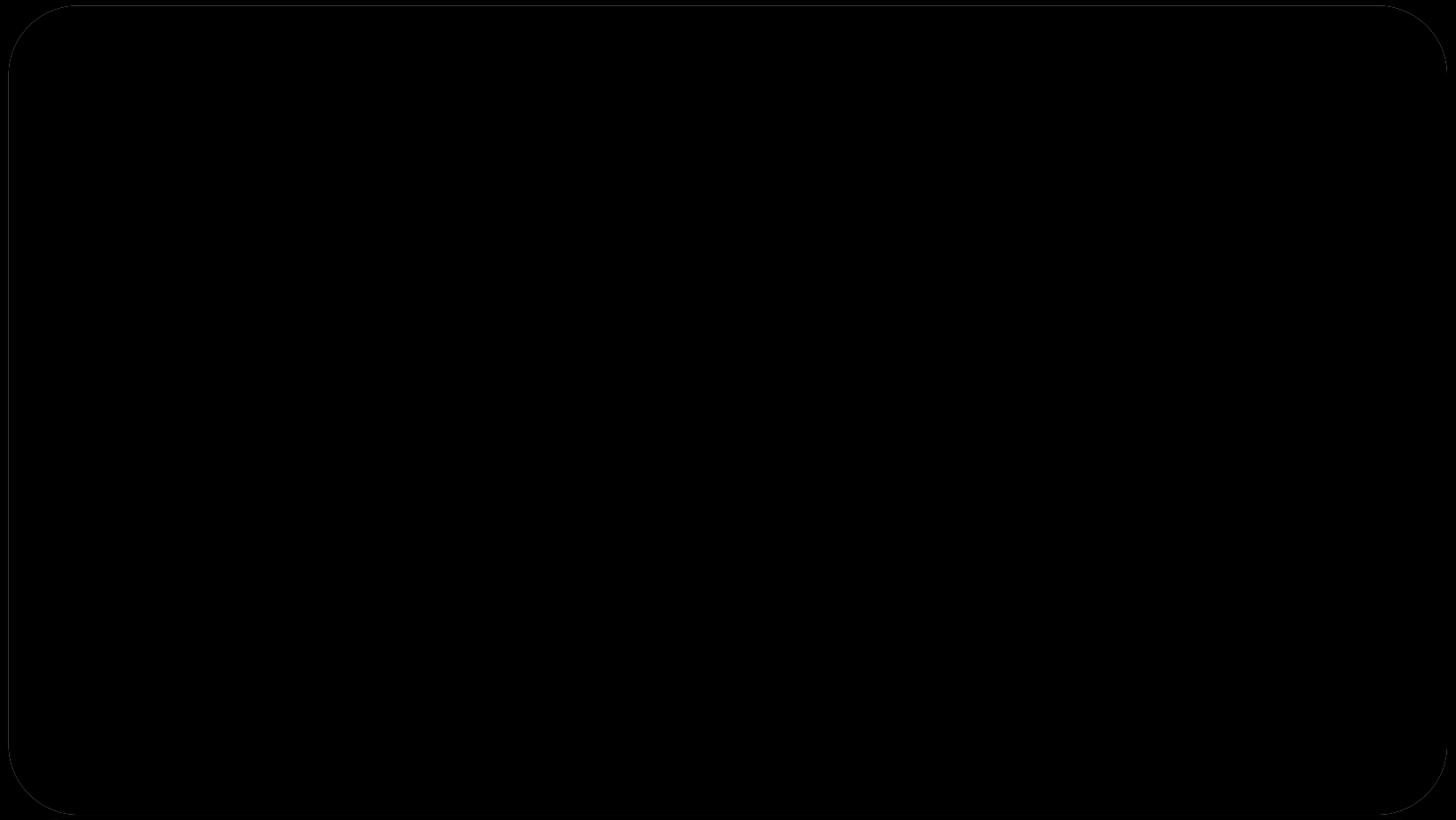
- Palliative RT
  - Weekly fractions, MST 18 months
    - Risk of long-term side effects such as brain necrosis
    - 6/8 cats – reduced insulin requirements

# Treatment options

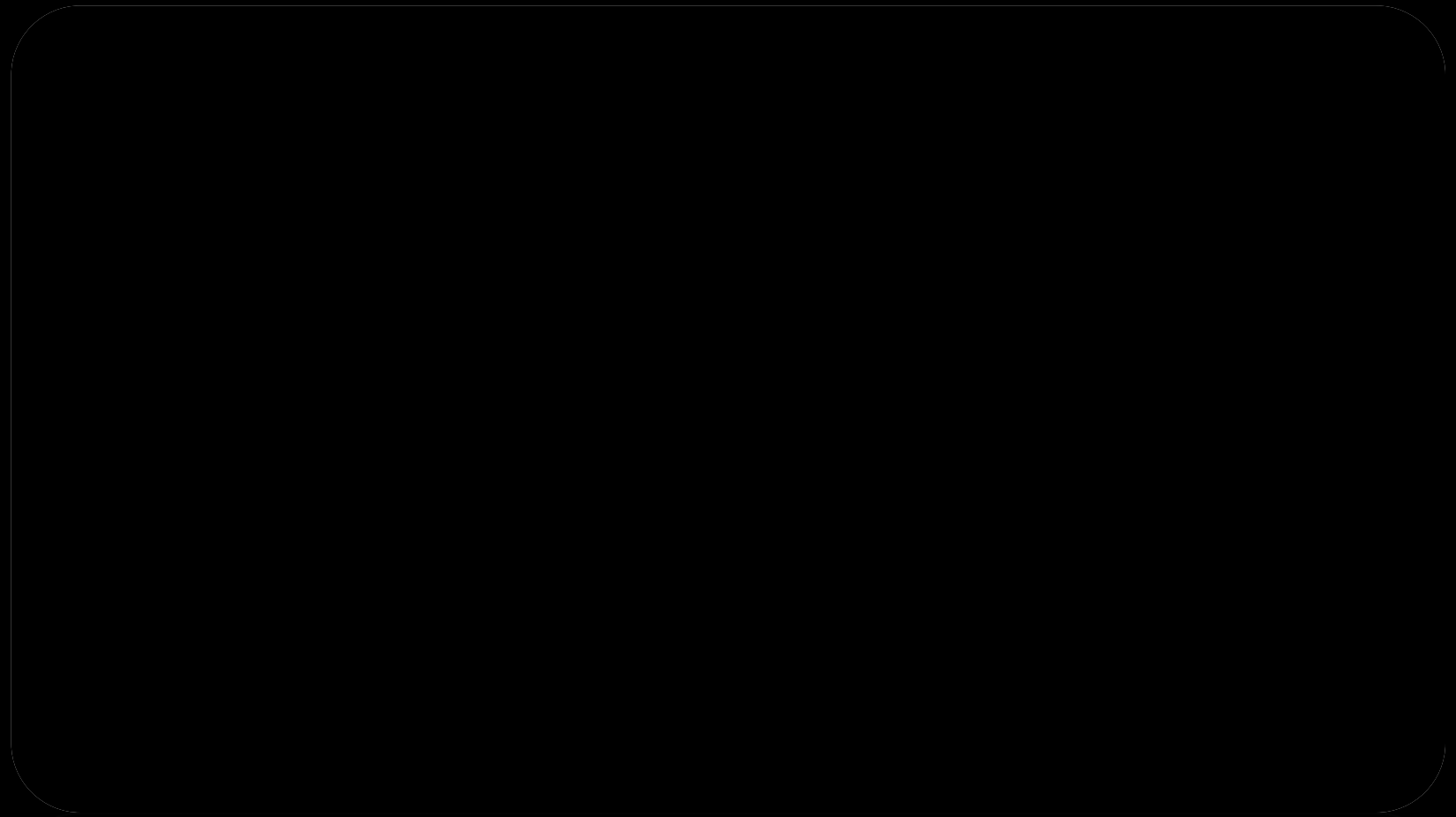
- Definitive RT
  - 20 fractions, MST 18 months
  - 6/6 cats had reduced insulin requirements
  - Low risk long term side effects

- Stereotactic RT
  - Large dose per fraction; 1-3 treatments
  - Highly targeted
  - MST 25-35 months
  - Of 53 cats, 95% need less insulin
  - 32% remission, Permanent in 62% and Temporary in 38%

# Radiation plan



# Outcome

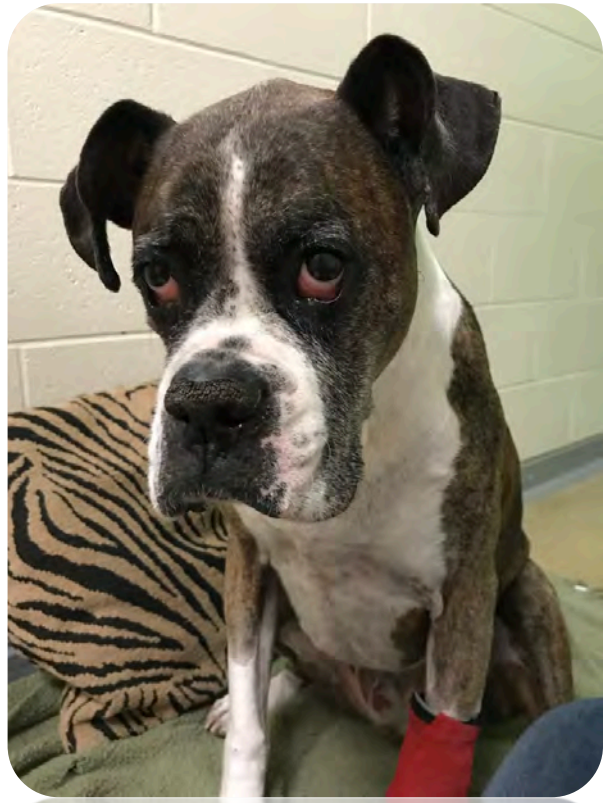


# Outcome

- Recent 6 month recheck with Internal Medicine
  - IBD worse – restarted chlorambucil
  - “Looks” Clinically normal
  - Heart disease stable

# What about more common PRIMARY brain tumours?

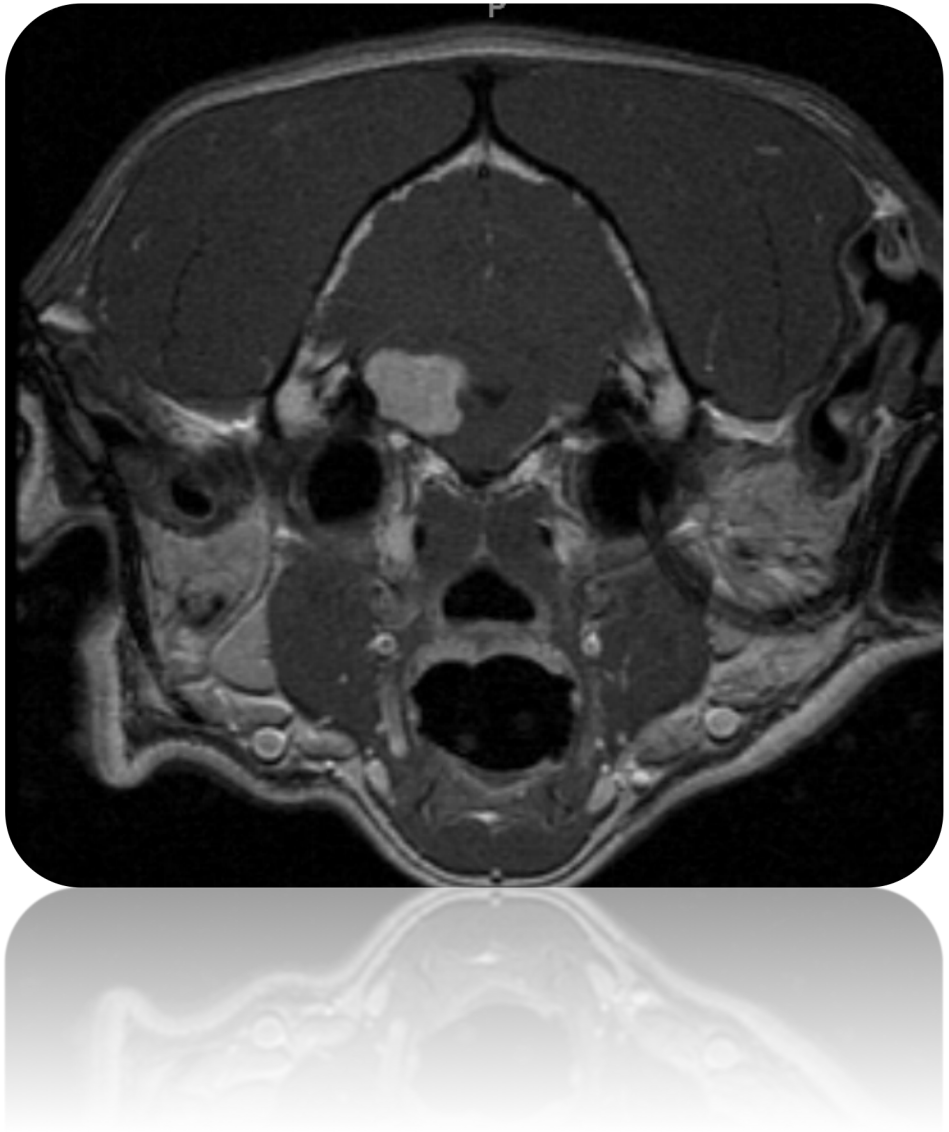
- Extraxial
  - Meningiomas, lymphoma, histiocytic sarcoma
- Intraaxial
  - Gliomas (astrocytomas, oligodendrogliomas)
- Ventricular
  - Choroid plexus, epdendymomas



# Treatment options

- Symptomatic therapy = 3 months *(Meervenne et al 2012, Dolera et al 2017)*

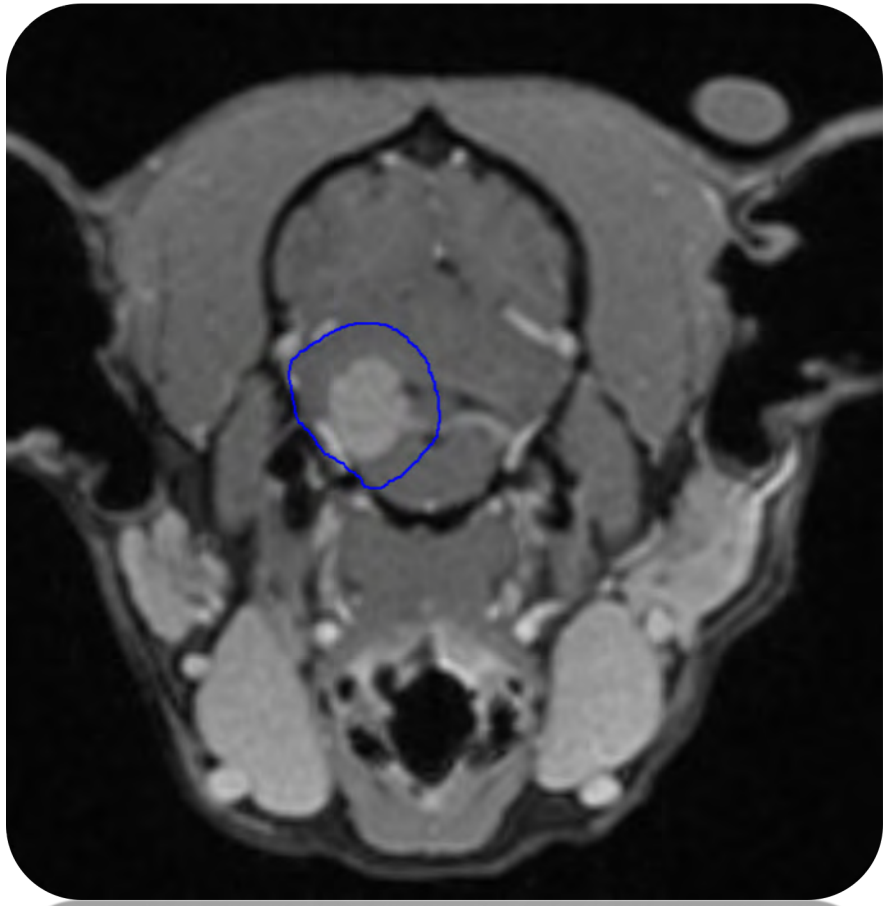
- Surgery alone = 7 months *(Auxland et al 2002)*



# Treatment options

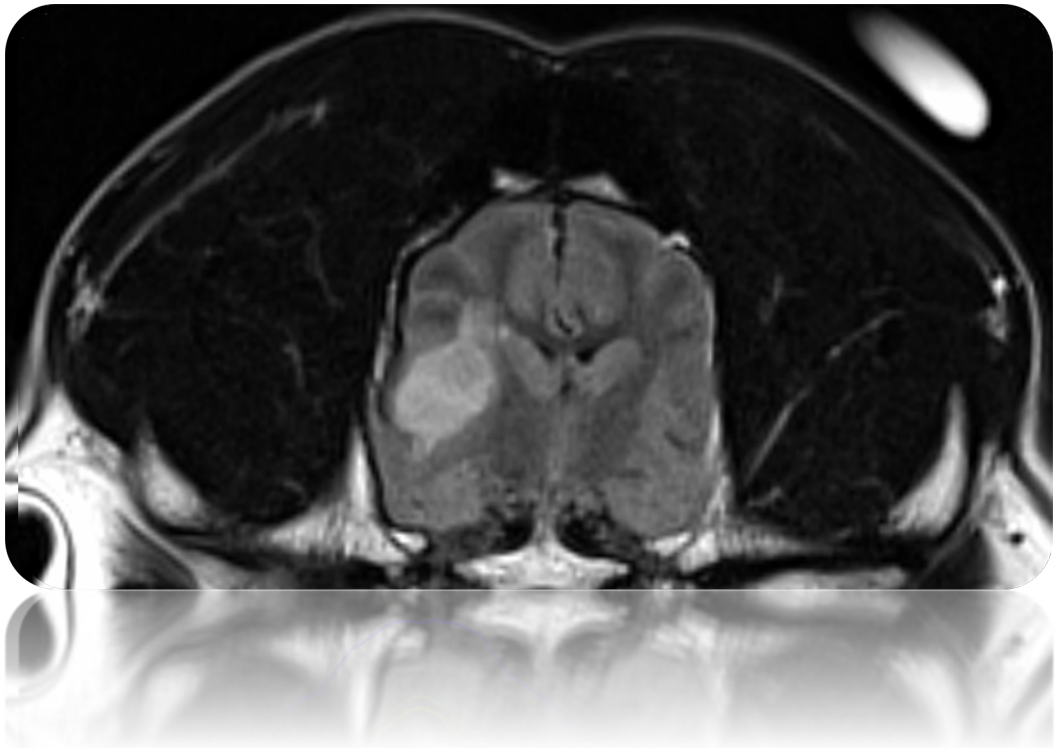
- Hypofractionated/palliative →10 to 14 months

- Definitive (+/- surgery) → 8 to 23.3 months



# Treatment options

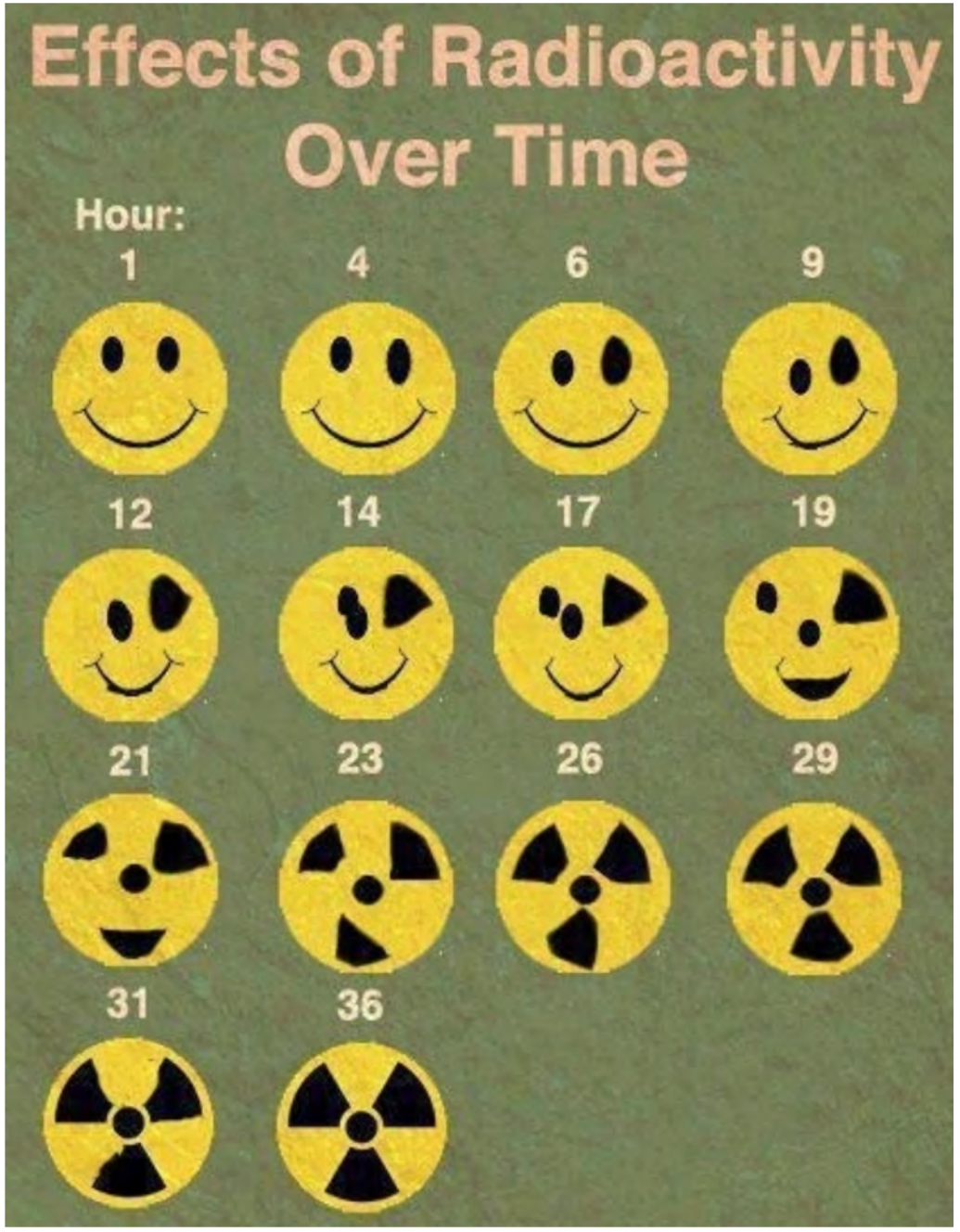
- Definitive + surgery → 16.5 to 30 months
  - (surgery and RT better than Sx alone)
- SRT/SRS → 13.3 to 18 months



# Treatment options

- Pituitary definitive →11.9 to ≥ 35 months
- Stereotactic
  - 8-11 months
- Sig longer survival than medical management

# QUESTIONS?

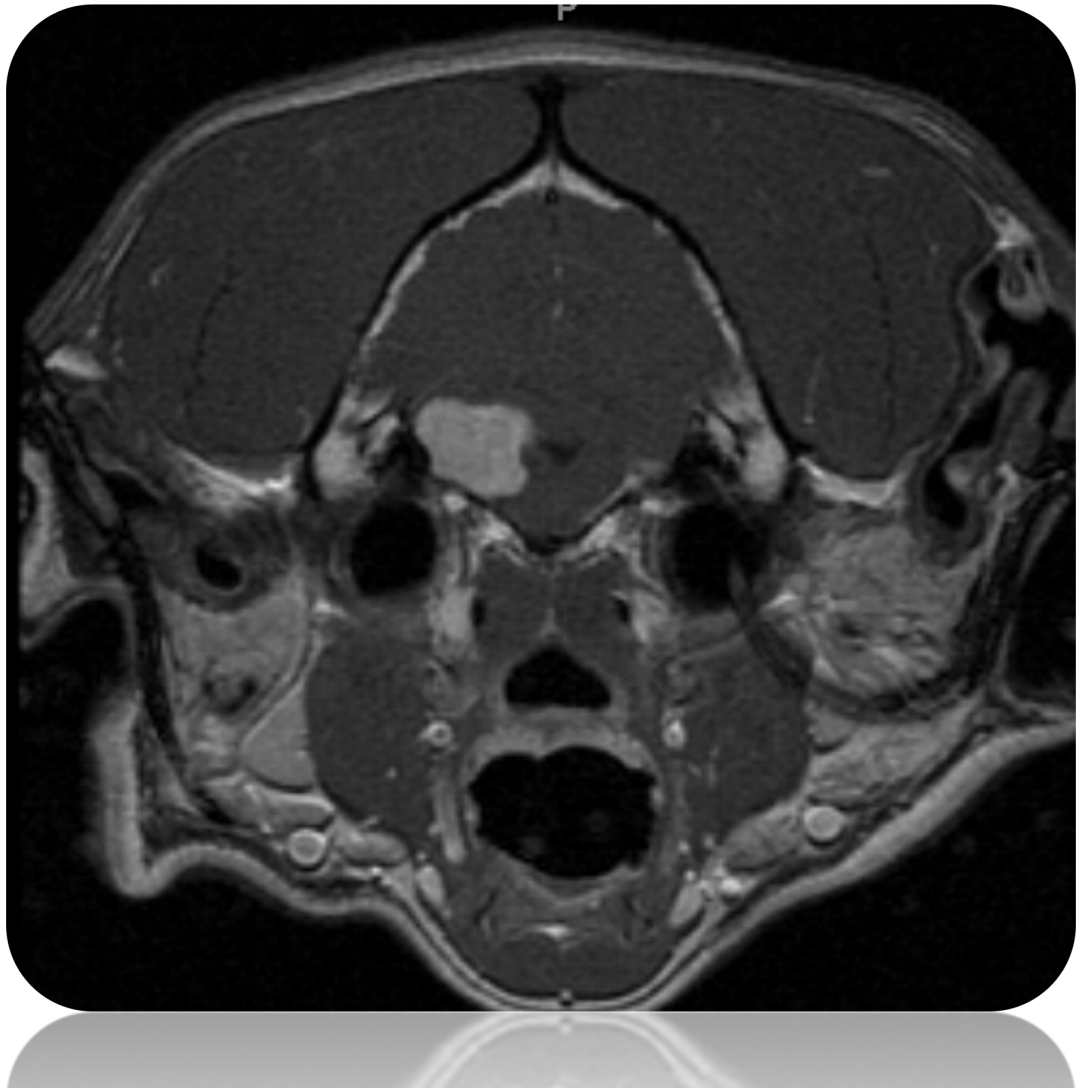

Effects of Radioactivity
Over Time
Hour:
1
4
6
9
12
14
17
19
21
23
26
29
31
36

# Vince

- Signalment
  - 6.5 yo MI Labrador
- History
  - 1-week history of ataxia, stumbling, and head tilt
  - Presented to neurology service
    - Right sided paradoxical vestibular

# Vince

# MRI



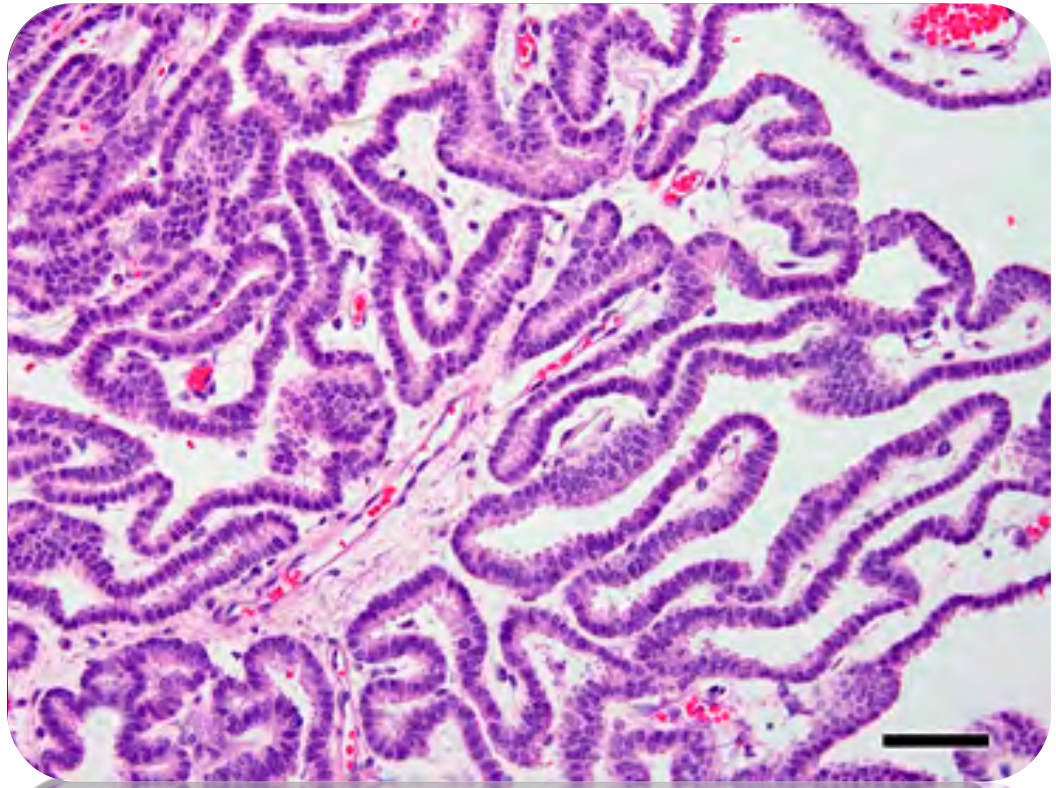
# Vince

- Treatment options
  - Surgery
  - Surgery + RT
  - Definitive RT alone
  - Stereotactic RT

- Presented 1 week post MRI due to continued neurological deterioration
  - Non-ambulatory
  - Surgery moved forward

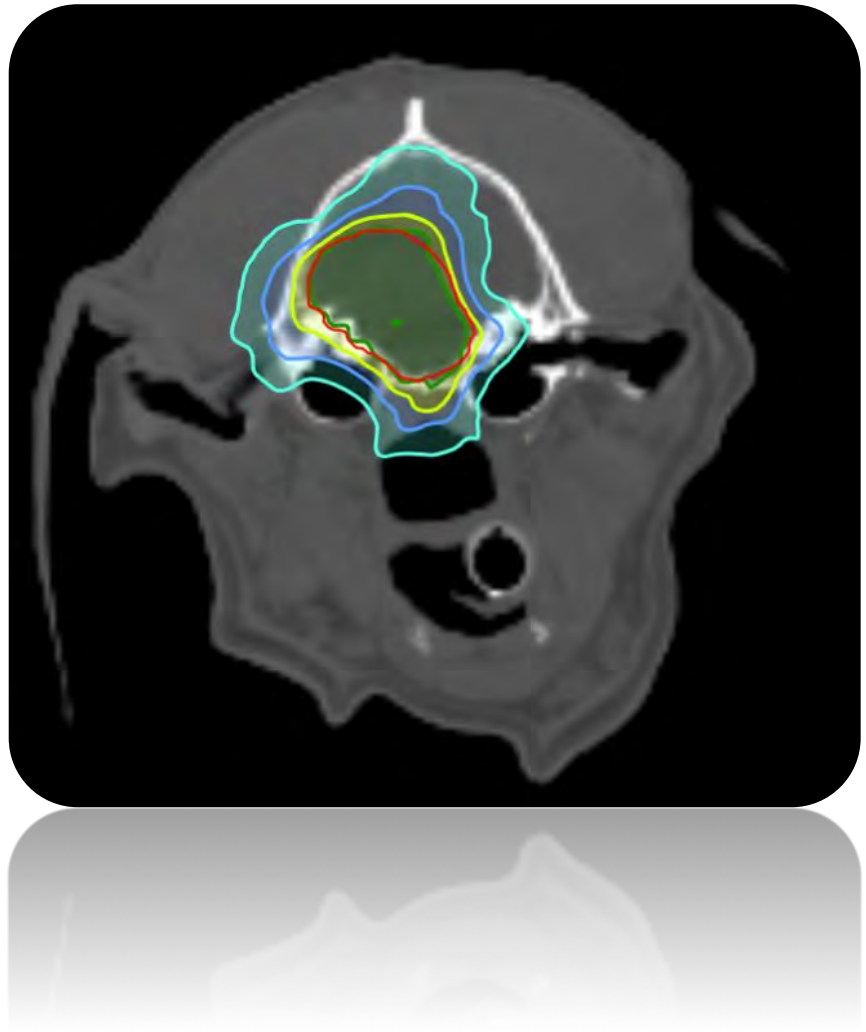
# Surgery - Outcome

- Acute deterioration post op
  - Non-ambulatory
  - Aspiration pneumonia
    - Cultured gram-negative rod on TTW
      - Enrofloxacin, potentiated penicillin
    - Histopathology = choroid plexus papilloma
    - Hospitalized in ICU for 10 days
    - Discharged when clinically improved still non-ambulatory



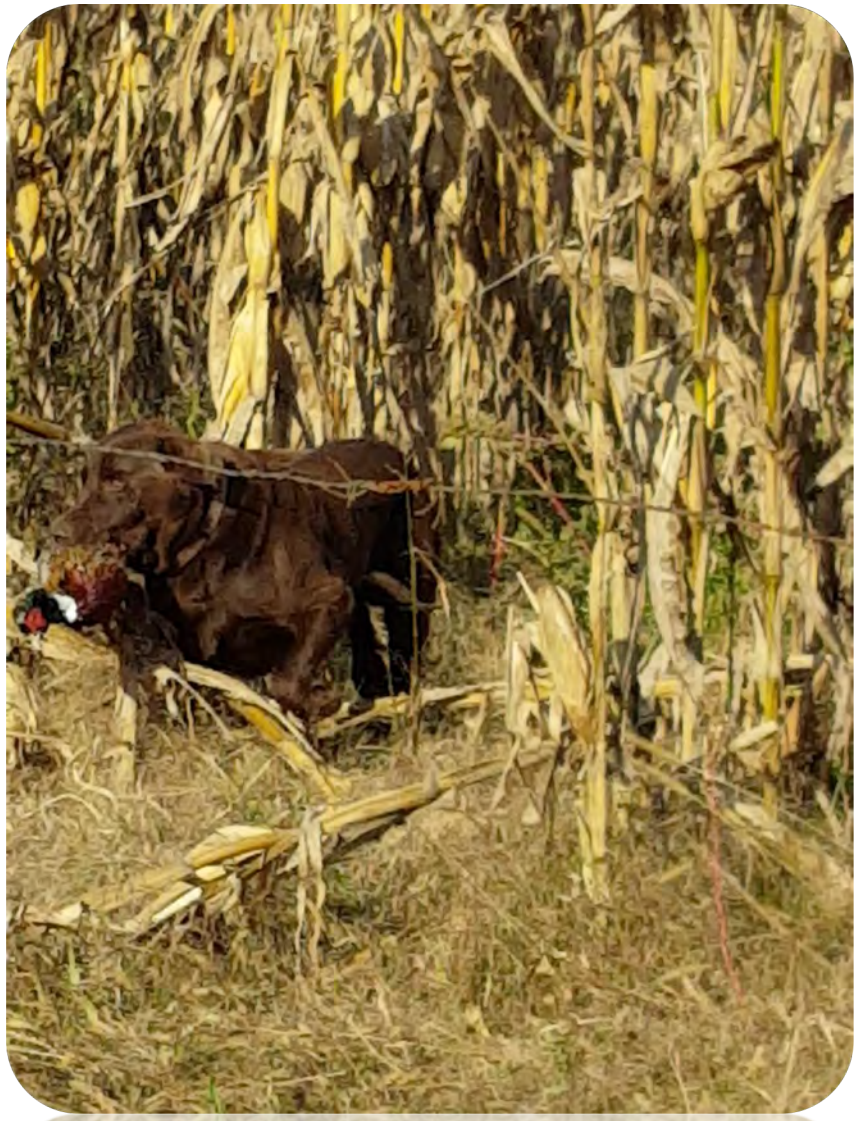
# Vince

- 3 weeks post surgery
  - Owners elected definitive radiation
  - Still non-ambulatory
  - 20 fractions of 2.5 Gy
  - Demeanor improved during RT
    - Still not ambulatory without harness support



# Vince

- 2 week recheck
  - Non-ambulatory
- Continued PT visits
- Vince 3 months post RT
- Still going



# QUESTIONS?