Radiation Therapy for Benign Diseases

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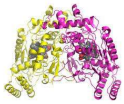
Mechanisms of Action

Anti-proliferative
- ROS increase after RT
- Stimulate production of inflammatory & fibrogenic mediators
- Association between ROS production & local ischemia
- Delay in cell cycle preventing cellular growth

Anti-inflammatory
- Inhibits iNOS
- Reduces endothelial/WBC interactions and adhesion
- Reduces vasodilation
- Decreased adhesion molecules



History

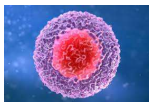
1831
Dupuytren's Contracture
Fibrotic contracture of palmar fascia of hand

1897
Ledderhose Disease
Fibrotic contracture of plantar fascia of foot

Mechanisms of Action

Immunomodulatory
- Regulation of lymphocytes antigenic stimulus
- Suppresses local autoimmune process

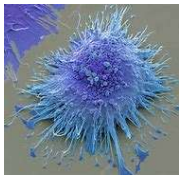
Functional modulation
- Modulating responses of autonomic nervous system
- Interferes with gene activation



History

Concerns for secondary malignancies arose
Nuclear bombs dropped in Japan
Chernobyl disaster

Cellular Effects



- Modulation of endothelial cells
  - Recruit inflammatory WBC
  - Allow transendothelial migration of WBC
- Modulation of leukocytes
  - Increased apoptosis
- Modulation of macrophages
  - Dose dependent
  - Polarized to M2 phenotype (anti-inflammatory) at low doses

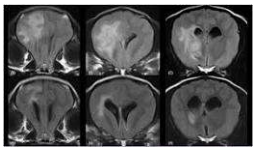
Indications

- Osteoarthritis
  - Hands
  - Feet
  - Hips
  - Spine
  - Shoulder
  - Elbow

- Other inflammatory skeletal conditions
  - Plantar fasciitis
  - Bursitis
  - Heterotopic ossification
  - Morbus Dupuytren
  - Morbus Ledderhose

MUO

- Most studies show that RT in combination with prednisone is better than medical therapy alone
- Question at hand is how much dose is necessary to provide a benefit but should be low enough to minimize risk for side effects

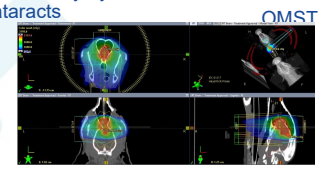


Indications

- Inflammatory conditions
  - Keloids
  - Pigmented villonodular synovitis
  - Graves orbitopathy
  - Peyronie's disease
- Benign tumors
  - Desmoid tumors
  - Vertebral hemangiomas

MUO

- Whole brain irradiation is performed
- Avoidance of eyes and lens' to avoid dry eye and cataracts
- 20-30Gy given over 5 to 10 treatments
- ORR is 60-80% within 3 months
- OMST is up to 400 days



Meningoencephalitis of Unkown Origin

- Non-infectious meningoencephalomyelitis
- Granulomatous meningoencephalitis (GME)
- Necrotizing meningoencephalitis (NME)
- Necrotizing leukoencephalitis (NLE)
- No gold standard of care
- Metanalysis included 457 dogs from 71 studies
- Still unable to identify preferred immunosuppressive treatment

Feline Rhinitis

- Case report out of Michigan State University in 2021
- 10 year old cat originally diagnosed in 2017
- Had full mouth dental extractions
- Managed intermittently with marbofloxacin and prednisolone
- Eats hydrolyzed protein diet
- MRI was performed due to anisocoria and signs of rhinitis were noted
- Histopathology diagnosed lymphoplasmacytic rhinitis
- 6Gy – 2Gy given daily for 3d
- Improved QOL and no side effects were encountered

Rhinitis

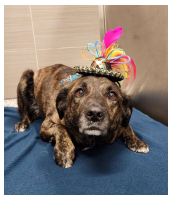
- 6 year old FS mixed breed
- Clear nasal discharge
- Progressed to sneezing
- Progressed to brown/yellow nasal discharge
- No obvious improvement with doxycycline
- Pre-anesthetic BW & thoracic rads were unremarkable
- CT & rhinoscopy performed
- Left nasal cavity contained moderately aggressive lesion but not mass with left frontal sinusitis
- Rhino showed area of inflamed tissue which was pale, frothy, and irregular
- Histo diagnosed severe chronic lymphocytic plasmacytic rhinitis

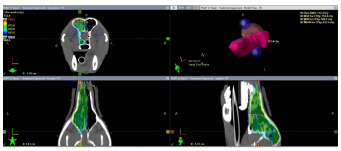
Feline Interstitial Cystitis

- 7 cats at NCSU – all males
- Long term symptoms – consideration for surgery or euthanasia imminent
- Single dose of 6Gy delivered to entire bladder and urethra
- Median time to response was 2 weeks, but response expected within 1 month
- 4 cats were >1 year since treatment
- All clients were satisfied with outcome and no cats had relapse of symptoms
- No further hospitalizations, obstructions, or surgery necessary

Rhinitis

- Due to severity of disease and cribriform plate lysis already present, young age of patient, radiation therapy was discussed
- Prednisone 0.5m/kg/d was prescribed
- Treated with 6Gy over 3 days in June
- Epistaxis episode in October





Feline Interstitial Cystitis

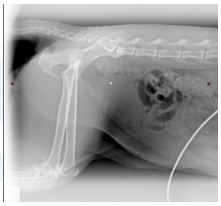
- 8 year old MC Siamese mix
- Signs started in 6/2023 - straining to urinate, inappropriate urination
- Rx: Gabapentin, Cerenia
- 2 ER visits – urinated on own both times; prazosin added
- Daily symptoms persisted on all of above Rx: buprenorphine & tamsulosin

Osteoarthritis

- Dogs with refractory elbow OA
- 40% were obese
- 50% had grade 4/5 lameness
- External beam radiation
- 6Gy given daily or EOD in 2Gy fractions
- No acute or late side effects reported
- ORR 92%
- MORT ~1 year
- ~90% overall client satisfaction with treatment
- Almost 50% received no medical therapy after RT
- 4 dogs were retreated and had ~400 days of medical benefit following second treatment protocol

Feline Interstitial Cystitis

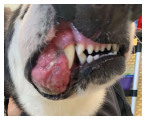
- Treated with single fx of 6Gy to bladder and entire urethra



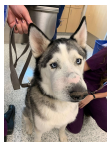
- Improvement in signs within 2 weeks of treatment

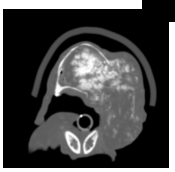
Benign tumors in dogs and cats

Epulides
Rare in dogs, rarer in cats



Fibromatous
Ossifying
Acanthomatous





Infiltrative lipomas

Benign tumors in dogs and cats

Infiltrative lipoma

Rare form of common disease

Invade through fascial planes, between muscle fibers, into joints and bone

Recurrence rate with surgery alone reported to be at least 50%

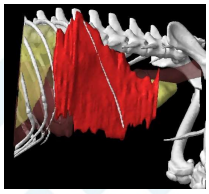
Consider definitive, curative intent radiation therapy (daily M-F for 16-18tx) for microscopic disease post surgery

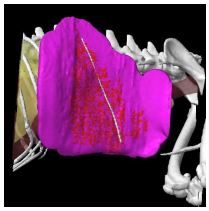
Palliative treatment on gross, bulky disease to shrink and/or temporarily stop the growth of the mass

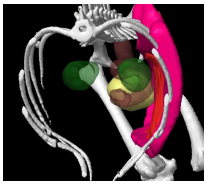
Benign tumors in dogs and cats

Polyps
- Nasal
- GI
- Aural
- Nasopharyngeal

Infiltrative lipomas







Benign tumors in dogs and cats

Rectal adenoma
Hemangioma

Consideration for these tumors developing due to carcinogenic changes due to environment and whether radiation therapy at especially low doses causing an accelerated growth and/or more lesions to develop sooner due to field effect

Questions?