PNST in Mixed Breed Dog

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The Facts

Canine, mixed, FS, 9 years
Scratching side of face
Decreased temporal and masseter muscle mass
Diagnosed with PNST trigeminal nerve on MRI
Radiation therapy ➔
  ◦ 32 Gy, 4 Gy X 8 treatments (12/8/15-12/18/15)
Clinically stable for 6 months
Subsequent progressive depression and ataxia
Euthanized 9/18/16, 9.2 months (276 days) post-RT
Decalcified temporal bone along canal for trigeminal nerve
Diagnosis

Peripheral nerve sheath tumor, trigeminal nerve and 8th cranial nerve
- Petrous temporal bone osteolysis
- Continuity with meningeal, choroid plexus and neuropil sarcoma

Meningeal sarcoma, radiation-induced
Criteria for Radiation-induced Sarcoma
RIS in Humans (Murray, 1999, from Cahan, 1948)

- **History of radiotherapy** with sarcoma arising in the area of the radiation field.
- **No prior evidence** that sarcoma was present before RT
- Sarcomas must be proven histologically and of **different pathology** compared with the primary tumor.
- **Latency period** longer than 3 years from initiation of radiotherapy to onset of sarcoma. [Latency of 6 months suggested as sufficient by Gladdy, 2010.]
Risk Factors

Interactions:
- High rad dose and simultaneous alkylating agents

Dose effects:
- Radiation > 55 Gy $\rightarrow$ increased risk RIS
- Radiation > 50 Gy $\rightarrow$ cell death
- Radiation < 30 Gy $\rightarrow$
  - Genomic instability
  - Damage cell repair mechanisms
- RIS $\rightarrow$ usually at edges of radiation field
- Dose at edge $\rightarrow$ less than tumor killing dose
- Threshold dose below which no sarcoma develops

Incidence of RIS (human):
- One study $\rightarrow$ 0.16%
Should dogs fear RIS?
No, dogs don’t lead a linear existence.

Tufts study (Hosoya, 2008), RT to appendicular sites

- **Census:**
  - 119 dogs, 122 sites, soft tissue tumors, no primary bone tumors

- **Incidence:**
  - 10 radiation-induced bone tumors
  - Sarcoma incidence → 8.4%
  - Osteoradionecrosis + sarcoma incidence → 11%

- **Latency period:**
  - Dogs → 2.7-8.7 years for RIS (literature 0.8-8.7 years)
  - Humans → mean latency 9.3 years
Radiation-induced Sarcoma

Conclusion

Radiotherapy can kill cancer cells regionally.

Radiotherapy can be tumorigenic.

Diagnoses for RIS of head and neck—human
- Osteosarcoma and fibrosarcoma → predominant
- Malignant schwannoma, neurofibrosarcoma, meningeal sarcoma → reported
Questions