BONE CANCER IN DOGS – CURRENT OPTIONS, NEW DIRECTIONS

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Canine OSA - Background

• Long bones affected most commonly
  – “Away from the Elbow, Toward the Knee”
Canine OSA - Background

- Large breed dogs
- 2 age groups affected:
  - Young dogs (18-24 months)
  - Older dogs (7-9 years)
Appendicular OSA - Presenting Complaints

• Lameness
  – *Often be chronic, progressive*
    • May initially respond well to pain meds/rest
    • Owners are likely to remember some trauma that started lameness
  – *May be acute, severe in onset*
Appendicular OSA - Diagnosis/Staging

- X-rays
  - *Limb*
Canine Appendicular OSA - Diagnosis/Staging

• Radiographs
  – *Limb*
  – *Chest*
    • 7% of dogs have detectable metastasis at first presentation
    • 90% have microscopic metastasis
Canine Appendicular OSA - Diagnosis/Staging

- Biopsy
- Fine Needle Aspirate
  - X-ray or ultrasound guided
  - Alkaline phosphatase staining
Biopsy

- **Risks / Problems**
  - *May be more painful for 24-48 hours following biopsy procedure*
  - *Risk of pathologic fracture (< 1%)*
  - *Nondiagnostic biopsy (7-10% chance)*
Osteosarcoma - Treatment

• Symptomatic pain management:
  – NSAIDs
  – Opiates
    • Tramadol
    • Codeine
    • Fentanyl patch
  – Gabapentin
  – Bisphosphonates (more later)
Canine Osteosarcoma

Amputation Alone -
Canine Osteosarcoma

Amputation Alone - 4 Month Median Survival time
Carboplatin

- Rapid IV injection once every 3 weeks
- Side effects rare (low white blood cell count most common, but usually not associated with illness)
- Roughly triples average survival time (from 4 months to 10-12 months)
Prognostic Factors

- Serum Alkaline Phosphatase
- Humerus location
  - *Are these tumors bigger on average?*
- Monocytes!
Research Article

Prognostic significance of circulating microRNA-214 and -126 in dogs with appendicular osteosarcoma receiving amputation and chemotherapy

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miR-214

Long-term

\begin{align*}
\text{% survival} \\
\text{Years}
\end{align*}

\begin{align*}
P = 0.0026 \\
\text{**}
\end{align*}

1-year

\begin{align*}
\text{% survival} \\
\text{Years}
\end{align*}

\begin{align*}
P = 0.011 \\
\text{*}
\end{align*}

\begin{align*}
\text{High (n=56)} \\
\text{MST: 296 days}
\end{align*}

\begin{align*}
\text{Low (n=20)} \\
\text{MST: 575 days}
\end{align*}
Follow-Up

• Recheck every 2-3 months
  – *Physical examination*
  – *Chest X-rays*
Contraindications to Amputation

- Severe neurologic disease
- Severe obesity
- Severe orthopedic condition
  - Mild/moderate arthritis is NOT a show-stopper in most cases
- Owner will not permit
  - Dispel myths
Canine OSA - Local Treatment Alternatives

- **Surgical Limb Salvage**
  - *Diseased bone removed and replaced with graft or metal implant*
  - *Joint fusion*
  - *Most effective in distal radius OSA*
Canine OSA - Treatment Alternatives

• “Palliative” Radiation Therapy
  – 0, 7, 21 days, weekly x 4, daily x 2
  – Well tolerated, outpatient, relatively inexpensive ($700-2000)
  – Good pain control in 75-90% of cases
  – Median duration = 2-4 months
  – Can be repeated
Bisphosphonate Drugs

- Pamidronate, zoledronate
  - Inhibitors of bone destruction
  - Primarily prescribed in humans for the prevention of osteoporosis
  - Can significantly reduce the pain associated with bone metastasis in humans

- Once-monthly injections
- About 1/3 of dogs show benefit
Stereotactic Radiation Therapy
Current CSU OSA SRT protocol

- Treatment planning CT
- SRT, 3 fractions daily
- Zoledronate pre-treatment
- Carboplatin chemotherapy with 1\textsuperscript{st} or 2\textsuperscript{nd} SRT
- Continue carboplatin as with amputation for 3 more treatments
- $7-8,000
- Average survival time same as amputation
- Risk of fracture
Immunotherapy with a HER2-Targeting *Listeria* Induces HER2-Specific Immunity and Demonstrates Potential Therapeutic Effects in a Phase I Trial in Canine Osteosarcoma

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