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## OSTEOSARCOMA: WHAT CHEMO? WHEN?

### Incidence and Risk Factors

Osteosarcoma (OSA) is the most common primary bone tumor in the dog (85% of skeletal malignancies). It is estimated to occur in over 8,000 dogs/year in the United States. OSA has bimodal age incidence peaks at 18-24 months and 7 years and occurs predominately in large to giant breed dogs in the appendicular skeleton at metaphyseal sites, whereas smaller breed dogs generally have their OSA in the axial skeleton. For appendicular OSA, the saying “Away from the elbow and close to the knee” is a good generalization; however, OSA can occur at sites such as distal tibia and others. In addition OSA is seen in the oral cavity (maxilla or mandibular), nasal cavity, ribs, digits and many other bony sites. The etiology of OSA is unknown but thought to be related to traumatic microfractures.

### Pathology and Behavior

OSA is a malignant mesenchymal tumor of primitive bone cells. The presence of extracellular matrix production of osteoid helps differentiate OSA from other bone sarcomas such as chondrosarcoma, lymphosarcoma, Hemangiosarcoma, and others. There are multiple histologic sub-classifications (osteoblastic, fibroblastic, chondroblastic, telangiectatic, etc.) for OSA; however, sub-classifications do not presently appear to be prognostic. OSA causes bone lysis, production of bone, or both; pathological fractures can occur. Less than 5% of dogs present with radiographically detectable pulmonary metastasis whereas > 90% have micrometastases at presentation.

### History and Clinical Signs

Most dogs with OSA present for lameness and/or swelling at the local site if appendicular in origin. For non-appendicular OSA, the history and clinical signs are dependent on the specific site of origin.

### Diagnosis

Local radiographs document soft tissue swelling, bone lysis, production of bone, or a combination of both. The differential diagnosis for OSA includes: Primary or secondary bone tumor, myeloma, lymphoma, and osteomyelitis. The definitive diagnosis of OSA requires bone biopsy. While most biopsies of cancer aim for the periphery of a lesion, bone biopsies should be taken from the center of the lesion and multiple biopsies should be performed. In addition, a full physical examination with close palpation of local lymph nodes (aspirate & examine if enlarged) is also recommended. For additional staging, three view thoracic radiographs are strongly recommended. The utility of additional staging diagnostics such as bone survey radiographs and/or nuclear medicine bone scanning are somewhat controversial. A surgical staging system suggests most OSA are stage IIb (high-grade, extra-compartmental and no gross metastasis).

# COMPANION ANIMAL

## ONCOLOGY

Therapy: The median survival times reported for appendicular OSA are summarized in the table below.

Treatment	Median DFI/MFI	Median Surv. Time	% alive at 1 year	% alive at 2 years
None		~ 45-60 days		
Amputation only <sup>1,2</sup>		110-112 days	10-12%	~ 2%
Amputation only <sup>3</sup>		175 days		
X3 Palliative RT <sup>4,5</sup>		73-122 days	7%	0%
X4 Palliative RT <sup>6</sup> (other Rx)		313 days	~37%	
Palliative RT & Carbo		103 days	25%	
Amp & Cisplat <sup>7-9</sup>	177-226 days	262-325 days	38-46%	16-21%
Amp & Doxo q 2wk <sup>10</sup>		366 days	50.5%	9.7%
Amp & Carbo <sup>11</sup>	257 days	321 days	35.4%	
Amp & OPLA-sponge <sup>12</sup>	256 days	278 days	41.2%	
Amp & Alt Dox/Cisplat <sup>3</sup>	210 days	300 days	37%	26%
Amp & combo Dox/Carbo <sup>13</sup>	195 days	235 days		
Amp & Dox/Cispl combo <sup>14</sup>	470 days	540 days	68.7%	25%
Followup Dox/Cispl				
Amp & Dox/Cispl (vcs abst)	330 days	300 days		
Amp & MTP & Cispl <sup>15</sup>	189-336 days	315-432 days	~ 40%	0 ~ 20%
Amp & lipo-Cisplat <sup>16</sup>	156 days	333 days		
Amp & Lobaplatin <sup>17</sup>		31.8%		
Amp & altern Carbo/Dox <sup>18</sup>	227 days	320 days	48%	18%

### Prognostic Factors<sup>19-41</sup>

#### Better

No overt metastasis  
 ↑↑ tumor necrosis (neoadjuvant chemotherapy only)  
 Mandibular location

#### Worse

< 5 yr age  
 ↑↑ tumor size  
 Proximal humerus  
 > 40 kg weight  
 ↑↑ ALP  
 ↑↑ grade

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