

“Let’s Talk About Legs”
A Case of Canine Osteosarcoma

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Introduction

Canine osteosarcoma is a disease that generally carries a poor prognosis, with treatment options being mostly palliative, rarely leading to remission or significantly lengthened disease-free interval. Regardless of treatment aggressiveness, patients often succumb to disease within 12 months of diagnosis. Due to the significant amount of pain involved with bone tumors, keeping the patient comfortable and pain-free becomes the hallmark of therapy. For this reason, removing the source of pain through surgery or radiation is often recommended regardless of the owner's choice in pursuing chemotherapy. After diagnosis, it is important to monitor for respiratory changes associated with pulmonary metastasis, and recognize when quality of life has declined.

History and Presentation

Allegra (affectionately known as Legs), an approximately 7-year-old female spayed Great Dane, presented to Mississippi State University-Animal Health Center Surgery Service on February 27th, 2018 with a history of lameness and carpal swelling. Reportedly, about 10-12 days prior to presentation, Legs bumped her right carpus on the car door while getting into the car. She faltered slightly but managed to get into the car on her own. Legs' owner reported that she acted painful at the time of the incident but seemed to recover quickly. Over the next few days, she started to become increasingly lame, and a swelling began to form on the dorsal aspect of her right carpus. Her owner took Legs to the referring veterinarian for evaluation. Radiographs of the carpus were performed and revealed a lytic and proliferative lesion at the distal radius. Due to suspicion of neoplasia, Legs was referred to MSU-CVM Surgery Service to pursue further diagnostics.

On initial presentation, Legs was bright, alert, and responsive but very anxious. Legs was mildly hyperthermic (temperature: 103.2 °F), tachycardic (pulse rate: 124 beats per minute), and she was panting heavily. Her mucous membranes were pink with a capillary refill time of less than two seconds. Her heart and lungs auscultated normally with no murmurs, arrhythmias, crackles or wheezes heard. She had a grade 3/4 right thoracic limb lameness with consistent limping and minimal weight bearing. There was a firm 4.5 x 6 mm mass on the dorsal aspect of the right carpus. The 3rd digit on the left hind limb was bleeding due to an abrasion obtained from getting into the car. There was also a small soft mass on the ventral and proximal aspect of the tail. All peripheral lymph nodes palpated soft, small, and symmetrical. The remainder of her physical exam was unremarkable. Based on signalment, history, and physical exam findings, the primary differential, in this case, was a primary bone tumor, such as osteosarcoma or chondrosarcoma. Further diagnostic tests would be necessary to prove this presumptive diagnosis and guide therapeutic recommendations.

Diagnostic Approach

Bloodwork was performed on Legs as a general health screen and as part of the staging process for suspect neoplasia. A Complete Blood Count (CBC) revealed a stress leukogram, which is commonly seen in dogs with chronic illness. Her chemistry panel revealed a mildly increased ALT, a low BUN, and a mild hypomagnesemia, none of which were of clinical concern. Thoracic radiographs were performed and there was no evidence of metastatic nodular pulmonary neoplasia. Repeat radiographs of the distal right radius were performed and revealed a monostotic, aggressive bone lesion that was consistent with a primary bone tumor. There was moth-eaten bony lysis with cortical destruction and a long zone of transition. Both lamellar and

amorphous periosteal bony proliferation were seen circumferentially along the entire lesion. There was also an oblique, sharply margined lucent disruption in the medial to dorsomedial cortex of the metaphysis of the distal right radius, which was consistent with a pathologic fracture. Increased soft tissue opacity and soft tissue swelling were seen circumferential to the lesion as well. A fine needle aspirate of this bony lesion was obtained and was sent for cytological evaluation. Results were consistent with sarcoma, most likely osteosarcoma. Histopathology was recommended for a definitive diagnosis.

Pathophysiology

Canine osteosarcoma (OSA) is a malignant tumor of mesenchymal origin that shares many biological similarities to human osteosarcoma. It is the most frequently diagnosed primary bone tumor in dogs, responsible for approximately 85% of aggressive bone tumors.¹ OSA tumors are most commonly associated with the metaphyseal growth plates of weight-bearing long bones within the appendicular skeleton, though primary tumors have also been described originating within the axial skeleton. The two most common locations for tumors to develop within the appendicular skeleton are the proximal humerus and the distal radius. In contrast to human OSA, where disease is most commonly reported in adolescent individuals who are still growing, canine OSA is most commonly occurs in middle-aged to older dogs long after the physes have closed.^{1,5}

In dogs, increasing shoulder height and body weight appear to be the two most predictive factors for the development of OSA, with giant breed dogs such as the Great Dane and Saint Bernard over-represented for the disease. In addition to the overwhelming prevalence of OSA in large and giant breeds, studies have also demonstrated the expression of insulin-like growth

factor-1 (IGF-1) in the cells of canine OSA tumors, further supporting the association between bone growth and the pathogenesis of canine OSA.¹

A defining feature of OSA is its high rate of metastasis, with predilection for the pulmonary parenchyma. Spread to regional lymph nodes, other bones, and soft tissues has been reported, but is infrequent. Dogs often already have radiographic signs of pulmonary metastatic disease at the time of diagnosis, and about 90% of dogs with OSA will eventually develop pulmonary metastasis, regardless of treatment. Combining amputation with chemotherapy increases median survival time to greater than 12 months in 40-50% of dogs, as compared to amputation alone which carries a 3-6 month median survival time. Single and multi-agent chemotherapy protocols, using cisplatin, carboplatin, and doxorubicin, have been employed in an effort to increase disease-free interval, and no significant differences have been proven between treatment modalities. Aggressive chemotherapy has not been shown to be effective in preventing metastasis from occurring.⁴

Treatment and Management

Following the results of the cytology with strong suspicion for osteosarcoma, Allegra's owner decided to pursue amputation as a palliative treatment. Allegra presented again to MSU-CVM Surgery Service on March 7th, 2018 to undergo right forequarter amputation. Once she was anesthetized, her right forelimb was aseptically prepped with chlorhexidine using a hanging leg technique and draped. A skin incision was made the spine of the scapula and extended circumferentially around the forelimb at the level of the proximal third of the humerus. Monopolar electrocautery was used to maintain hemostasis throughout the procedure. The trapezius and omotransversarius muscles were transected using electrocautery at their insertions

on the spine of the scapula. The rhomboideus muscle was then transected from its attachment on the dorsal border of the scapula using electrocautery, allowing the scapula to be retracted to expose the medial surface of it. Once this was complete, the brachial plexus, axillary artery, and axillary vein were exposed. The axillary vein and artery were ligated and transected. The axillary lymph node was carefully dissected and preserved. The brachiocephalicus, deep pectoral, superficial pectoral, and latissimus dorsi muscles were then transected using electrocautery, completing the amputation. Remaining muscle was used to cover the exposed nerves of the brachial plexus. Subcutaneous tissues were closed with a combination of simple continuous and simple interrupted patterns. A stab incision was then made 2 cm caudoproximal to the incision, and a soaker catheter was placed through the incision and passed under the muscle to the level of the brachial plexus. The catheter was sutured in place and the skin was closed in an intradermal pattern. The right forelimb and right axillary lymph node were submitted for histopathology. Allegra recovered well from anesthesia and spent the subsequent 2 days recovering in the hospital. To control post-operative pain, she was given Tylenol 4 and carprofen orally, and bupivacaine was administered through her soaker catheter for local analgesia. During her hospital stay, she went on assisted sling walks outside to aid in building up strength in her left forelimb. She was discharged on March 9th, 2018 with instructions for incision care, and exercise restriction during her adjustment to walking on three legs. At the time of discharge, no decision had been made as to whether Allegra would undergo chemotherapy.

With osteosarcoma, the average survival time of dogs treated with amputation alone is approximately 4-6 months, with most of these dogs ultimately succumbing to pulmonary metastatic disease. It was discussed that the best chance for long-term control of Allegra's osteosarcoma would involve the addition of chemotherapy after amputation. When

chemotherapy is initiated, therapy starts approximately 2 weeks postoperatively, to allow time to heal and recover from surgery. The current protocol at MSU-CVM includes 1 treatment of carboplatin chemotherapy, every 3 weeks, for 6 total treatments. With amputation followed by carboplatin chemotherapy, the average survival time for osteosarcoma is 1 year with 20% of dogs alive at 2 years and 10% alive at 3-5 years (likely this small percent is cured).^{3,5}

Case Outcome

Histopathology results from the submitted right forelimb yielded a definitive diagnosis of osteosarcoma, giant cell variant. There was no evidence of neoplastic cells in the axillary lymph node. Approximately one month after amputation, on April 11th, 2018, Allegra presented to MSU-CVM Oncology Service for a chemotherapy consultation. At this visit, bloodwork was repeated, as well as thoracic radiographs. At this time, radiographs revealed a diffuse structured interstitial pulmonary pattern characterized by numerous round, smoothly marginated, soft tissue opaque nodules. These findings were consistent with metastatic pulmonary neoplasia. It was discussed with the owner that once there is radiographic evidence of pulmonary metastasis, the prognosis for survival time with chemotherapy is not different from that of palliative care alone. She was discharged with prescriptions for maropitant as an anti-tussive and anti-emetic, as well as mirtazapine as an appetite stimulant in an effort to keep Legs as comfortable as possible. At 6 months out from the time of diagnosis, Legs is still alive and is not displaying clinical signs of respiratory disease.

References

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