Canine Osteosarcoma

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Osteosarcoma is a devastating diagnosis, both for a veterinary health care team to give to an owner and for a pet owner to accept. Osteosarcoma is the most common primary bone cancer diagnosed in veterinary medicine. There are also other less frequently diagnosed bone malignancies, including chondrosarcomas, hemangiosarcomas, and fibrosarcomas.[1,2] This article focuses on the presentation, diagnosis, treatment options, and nursing care of canine osteosarcoma patients.

History

Osteosarcoma is the most commonly diagnosed bone malignancy in veterinary medicine. It accounts for approximately 80% of diagnosed bone tumors in dogs.[1–4] Osteosarcoma is most common in middle-aged or older, large- and giant-breed dogs.[1,2,4,5] However, it can also be seen in medium-sized dogs.[1–3,5] Osteosarcoma is a highly aggressive cancer, typically manifesting as soft tissue swelling at the affected site. Metastasis is not commonly seen in radiographs of the lungs at the time of diagnosis; however, approximately 85% to 90% of patients have micrometastasis at the time of diagnosis.[3,5] In patients with osteosarcoma, the lungs are the primary site of metastasis; secondary sites include the bones, viscera, and lymph nodes.[6] Although osteosarcoma tends to be aggressive, it typically does not cross the joint space to affect other bones.[2]

Presentation

On presentation, the most common owner complaint is lameness, along with swelling and pain in the affected area. The onset of the lameness is followed by swelling in the affected limb within 1 to 2 weeks, although the time can vary depending on the location of disease involvement.[3,4,7] Osteosarcoma is classified as appendicular or axial. Appendicular osteosarcoma affects the appendages (i.e., legs) of dogs and is most common in large-breed dogs. The most common sites of appendicular osteosarcoma are the distal radius and proximal humerus in the forelimbs and the distal femur and proximal and distal tibias of the hindlimbs. Axial osteosarcoma, the less aggressive type,[1–3,5] commonly involves the pelvis, ribs, or various areas of the skull.[1] Axial osteosarcoma is most common in medium-sized dogs.[1]

The diagnostic process for osteosarcoma is similar to that for other cancers. Definitive diagnosis requires a biopsy. Often, a presumptive diagnosis of osteosarcoma is made based on clinical signs, physical examination, and radiography of the affected limb or area. Most often, at the time of diagnosis, whether presumptive or definitive, osteosarcoma has developed into an advanced stage (i.e., stage III) due to its aggressive nature.[1,2,5,8] The tumor staging is based on the World Health Organization's and Veterinary Cancer Society's clinical staging systems of tumors.[8] Stage III indicates that distant metastasis is present.[8] A common alteration on the blood chemistry profiles of patients with osteosarcoma is an elevated alkaline phosphatase (ALP) level.[5,7] Studies have associated an increased ALP level with a guarded prognosis.[5,7]

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Cancer staging is valuable because it provides the veterinary team with the information needed to help the owner make the best decision for the pet. Before a treatment protocol is initiated, preferably by an oncologist, several components are evaluated. Staging a tumor involves evaluating local and distant disease, whether or not it is neoplastic.

The following diagnostics are critical for helping determine how to best manage a patient: physical examination, complete blood count, blood chemistry profile, urinalysis, ultrasonography, three-view chest radiography, and/or computed tomography of the thoracic cavity to detect subtle metastatic lesions. Traditional radiography is unlikely to detect micrometastasis because the metastases are too small. Computed tomography can detect small changes much better.

Paraneoplastic syndromes can be identified and managed.[5] These syndromes are clinical manifestations of neoplasms affecting areas of the body distant from the tumor. Examples of potential paraneoplastic complications include anorexia, protein-losing enteropathy, hypercalcemia, anemia, hypoglycemia, hyperglycemia, thrombocytopenia, and alopecia.

Glossary

Adjuvant chemotherapy—chemotherapy that assists in treating cancer (i.e., after surgery)

Appendicular—relating to an appendage such as an arm or leg

Axial—relating to the skeletal parts of the trunk or head

Definitive treatment—treatment focused on curing a disease process

Dry desquamation—peeling of the skin or area being radiated in a dry manner

Gy—abbreviation for gray (the unit of measure used for radiation therapy), which is equal to 1 joule/kg of irradiated material

Micrometastasis—the presence of microscopic tumors at secondary sites; it is not detectable on radiographs

Osteoclasts—large, multinuclear cells in bone that remodel damaged bone

Palliative treatment—treatment focused on relieving pain, not curing a disease process

Paraneoplastic syndrome—cancer-associated structural or functional changes in a patient's body occurring at sites distant from the primary cancer location

Periosteum—fibrous membrane covering the outer surface of the bone except for the articular surface

Treatment

The goal of treating osteosarcoma is to control local pain and distant disease.[2,4,7–10] Treatment options include surgery, chemotherapy, pain management/analgesia, and radiation therapy. Local pain can be controlled with analgesics, surgery, and radiation therapy. Distant disease can be controlled with chemotherapy.

Managing the patient's pain is a critical concern for owners and the veterinary team. As osteosarcoma progresses, it becomes increasingly painful because increased pressure within the bone stretches the periosteum.[4,9] As a result, osteosarcomas grow outward, accounting for the pain and swelling generally noticed on physical examinations.

The prognosis for most osteosarcoma patients is grave. Most have a median survival time of 4 to 12 months, with

[a]Impellizeri JA. Personal communication.

or without treatment.[2–5,7] The patient's prognosis and treatment options are discussed with the owner after evaluation of the patient, physical examination findings, and diagnostic results by a board-certified oncologist. Discussion with the owner regarding the correct treatment modality or combination of modalities for the patient is vital for clear communication and expectations. For example, a severely obese, arthritic dog may not do well after an amputation; therefore, medical management with palliative care may be the best choice.

Surgery—Depending on the patient, surgical amputation can be appropriate for treating appendicular osteosarcoma. The patient should be evaluated by an experienced specialist (i.e., an oncologist or surgeon) to determine whether it is a candidate for amputation. A common client concern regarding amputation is the quality of life for three-legged animals, especially large dogs. Most dogs adjust quite well and fairly quickly to being three-legged. The median survival time with amputation alone is approximately 4 to 6 months.[1–3,5,8] Adjuvant chemotherapy can be used to delay the progression of metastatic disease. If the patient is not a good candidate for surgery or if the owner does not want to pursue it, medical management must be implemented.

Chemotherapy—Chemotherapeutic drugs for treating osteosarcoma are used to alter the course of the metastatic disease process (i.e., slow down the metastatic component of the disease). Commonly used chemotherapeutic drugs include platinum drugs (i.e., carboplatin or cisplatin) and doxorubicin.[5]

Immunotherapy—Immunotherapy is an increasing area of research in which autogenous vaccines are under investigation.[a]

Pain Management/Analgesia—Because of the painful nature of osteosarcoma, pain management is critical to patient care. Pamidronate, an aminobisphosphonate, can be used in combination with other treatment options to provide analgesia.[5,11] Studies are being performed to establish its efficacy. One study has shown a decrease in pain when pamidronate is used in conjunction with NSAIDs[5] (anecdotally, many oncologists think there is value in controlling bone pain). Osteosarcoma can be extremely painful, and finding a drug or combination of drugs to alleviate the pain can be difficult. Analgesia options include administration of opioids, NSAIDs, tramadol, amantadine, or gabapentin as well as radiation therapy.

Radiation Therapy—Radiation therapy can be used as a palliative or definitive treatment. In treating osteosarcoma, radiation therapy is most often used for palliation, to eliminate or reduce pain. Radiation therapy does not prolong survival[7] but can improve the quality of life by reducing pain. To alleviate pain, radiation therapy not only kills tumor cells and inflammatory cells but also decreases bone destruction caused by osteoclasts.[4] Oral pain medications are administered after radiation therapy.

The radiation therapy protocol should be designed by a board-certified radiation oncologist. Many protocols exist. One protocol uses two consecutive treatments of 8 Gy/day on days 0 and 1 for a total dose of 16 Gy.[4,7] Another protocol uses three spaced treatments of 10 Gy/day on days 0, 7, and 21 for a total dose of 30 Gy.[4,7] The treatment field generally involves the radiographic extent of the tumor with 2- to 3-cm margins on all sides.[4,7] Generally, pain relief begins approximately 2 weeks after treatment and can last 2 to 4 months.[4,5,7,11] If pain returns, the radiation oncologist may recommend repeating the previous radiation protocol. Retreatment is not performed if the owner declines it or if a fracture has occurred at the affected site. Radiation therapy protocols are designed to deliver an effective dose of radiation that is unlikely to cause significant acute effects. The adverse effects vary according to the patient and area being treated. With protocols involving two or three treatments, adverse effects are rare but may involve dry desquamation or alopecia.

The Technician's Role

Veterinary technicians must closely monitor patients that are sedated or under general anesthesia while undergoing surgery, diagnostics, chemotherapy, or radiation therapy. Patients undergoing painful diagnostics, surgery, or radiation therapy are placed under general anesthesia. Bone affected by osteosarcoma can fracture easily. This is important to remember when affected patients are waking from anesthesia. To avoid a fracture, these patients should be placed in a cage or run under technician supervision .

Veterinary technicians may also be responsible for client communication, which can help determine the patient's needs. Changes in the patient that are shared by the owner can indicate the recurrence of pain and a need to adjust the treatment protocol. These changes include the eating and drinking habits of the patient, lethargy, lameness, or other signs of pain. In cases of appendicular osteosarcoma, the patient can be fitted with a sling before leaving the clinic to allow mobility but reduce pressure on the affected limb. The veterinary technician should describe the appropriate home care for the pet. The owner will need to know what to watch for to assess the pet's pain level. The owner will also need to inhibit the physical activity of the pet, even though the pet may feel better and appear to be nonpainful (likely because of pain medication). The owner must know that allowing the pet to use the affected limb in a normal capacity can result in a fracture.

Conclusion

Osteosarcoma is a serious and painful disease, but there are options for improving patient comfort. Although amputation is the most common recommendation, it is not always accepted by owners for financial or other reasons. When owners decline amputation, other options need to be presented to improve patient comfort. The most common option is multimodal pain management with various drug combinations and palliative radiation therapy. Regardless of the treatment protocol, the veterinary technician needs to be an advocate for the patient and its comfort. **VT**

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