responses were noted in four (33%) cats. The durations of PR ranged from 41 to 144 days, with a mean and median of 98 and 103 days, respectively. The two cats with radiographic evidence of pulmonary metastasis had complete clinical resolution of their recurrent primary tumors and an estimated greater than 50% reduction in pulmonary lesions. In two cats classified as responders, the decrease in tumor size exceeded the 50% reduction threshold until the third cycle of chemotherapy. The overall response rate (i.e., MR and PR) was 50%. The mean and median durations of all responses were 122 and 125 days, respectively.

The median survival time among the responders was 282 days, with a range of 223 to 406 days and a mean of 298 days. The median survival time of the nonresponders was 115 days, with a range of 30 to 315 days and a mean of 155 days. The difference in survival times between the responders and nonresponders was not statistically significant. However, when animals that received other treatments after doxorubicin-based chemotherapy were eliminated from the analysis, the difference in survival times between cats that responded to the doxorubicin and cyclophosphamide protocol and those that did not was statistically significant at a p value of 0.039. In this subset of seven cats, median survival time was 242 days among the responders and 83 days among the nonresponders.

All 12 cats had measurable disease at the time of their deaths. One cat, a MR, developed azotemia. The role of potential renal failure in this animal's death is unclear, but it is suspected to be the proximate cause of death by the referring veterinarian. Two cats that were nonresponders were lost to follow-up. The presumed cause of death or reason for euthanasia of the remaining eight cats was tumor progression.

No treatment-related toxicity was noted in four (33%) cats. Three (25%) cats experienced mild to moderate, self-limiting toxicities that did not require adjustments in the dose of chemotherapy administered on subsequent cycles. Treatment-related toxicity required 15% to 25% dose reductions in three (25%) cats and contributed to the decision to discontinue chemotherapy in two (18%) cats. The risk of toxicity did not correlate with the dose of doxorubicin administered.

Adverse gastrointestinal effects were reported in six cats. These signs (i.e., self-limiting anorexia or occasional vomiting) were mild in five cats and did not interfere with subsequent chemotherapy. One cat experienced anorexia and vomiting for greater than one week, necessitating a 25% dose reduction, after which mild anorexia was reported. The owners of two cats reported severe lethargy and anorexia that had minimal toxicity with previous cycles; both cats were also failing due to PD during that treatment cycle.

Hematological toxicity was documented on CBCs in five cats. Mild neutropenia (2.0 to 3.0 $x10^3$ cells/µl; reference range, 3.0 to 12.5 $x10^3$ cells/µl) occurred in three cats between days seven and 10 of the chemotherapy cycle. One animal developed moderate neutropenia (1.0 to 2.0 $x10^3$ cells/µl). Another developed severe neutropenia (less than 1.0 $x10^3$ cells/µl), requiring 15% to 25% dose reductions three times. None of the cats exhibited clinical signs referable to the neutropenia. Significant anemia (i.e., packed cell volume [PCV], 20% or less; reference range, 27% to 45%) was not detected in any cat while receiving chemotherapy.

Potential renal toxicity was discovered in one cat (creatinine, 3.4 mg/dl; reference range, 0.5 to 2.0 mg/dl; urine specific gravity, 1.014), which was reported to be progressive by the referring veterinarian. This cat had received five cycles of doxorubicin. Another cat developed pyelonephritis during doxorubicin chemotherapy, which was possibly related to an undetected episode of neutropenia.

Five cats received additional treatments after doxorubicin and cyclophosphamide chemotherapy. Two cats underwent surgery to resect residual disease. Surgery was performed by the referring veterinarian in case no. 4 after four cycles of chemotherapy. The tumor recurred shortly after this surgery. Resection was attempted three more times before the cat died approximately one year after beginning chemotherapy. The second cat (case no. 8) that underwent surgery after chemotherapy had a MR. Upon initial presentation, recurrent tumor was present along the surgical scar from prior resection. In addition, small nodules of tumor were detected, extending distal to the scar along the medial thigh. At the time of surgery, no gross tumor was evident. Since the owner declined amputation for the cat, resection of the scar was performed. No neoplastic cells were detected in the excised tissue on histopathological examination. Tumor recurrence was noted on the medial thigh distal to the surgical incision within two months.

Three cats received carboplatin IV or intralesionally or both after developing PD. Case no. 7 received the drug by both routes without objective tumor response. Case no. 11 had a PR to intralesional carboplatin in a filtered sesame oil emulsion. Case no. 12 had no response to a single dose of carboplatin IV.

Discussion

The aggressive behavior of feline vaccine-associated sarcomas has proved frustrating for the veterinary clinician. The high probability of recurrence after surgery, alone or in combination with radiation therapy, suggests the need to explore other treatments that might enhance the chance of cure in the first occurrence of the tumor and help control recurrent tumors.

Chemotherapy as a sole therapy is unlikely to cure patients with gross solid tumors. One of the goals at the time of treatment in these cats was to render a nonresectable tumor amenable to surgical excision. This was accomplished in four of 12 (33%) cats. The two (17%) cats that underwent surgery nevertheless developed recurrent disease. However, the surgery performed was not radical in either of these cats. This suggests that this chemotherapy protocol cannot com-