Vaccine Immunotherapy for Aggressive Meningiomas in a Canine Model

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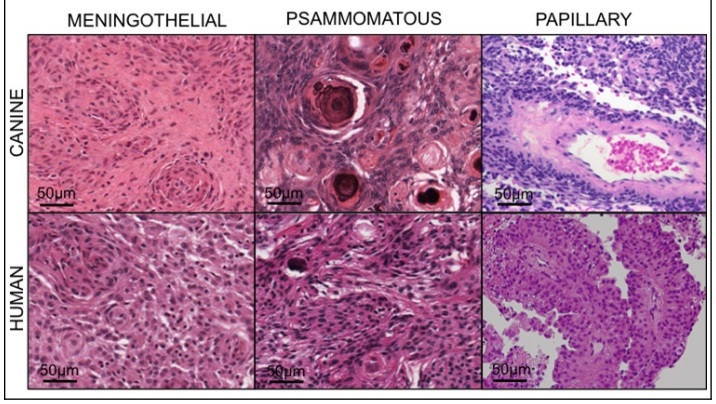
Introduction

Atypical and malignant meningiomas make up approximately 8% of all meningiomas in humans. They are resistant to standard therapies and have a poor prognosis despite salvage treatment with re-operation, radiation, and chemotherapy.

Dogs have spontaneous meningiomas and these have a number of radiographic and histopathologic similarities to those in humans. In addition, their cranium and brain are large enough to allow surgical resection as a primary treatment, mimicking therapy in humans.

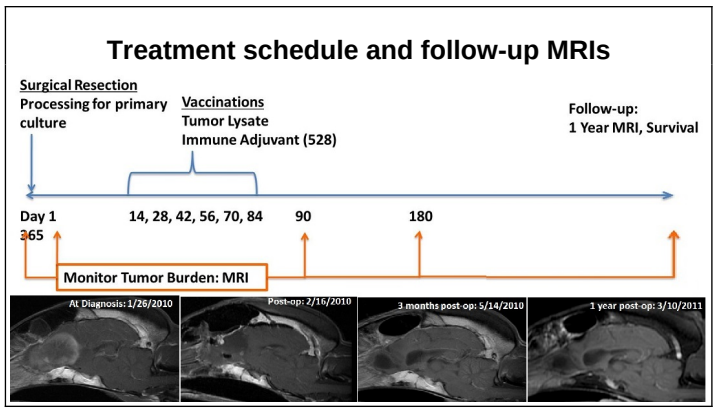
Histologic similarities between canine and human meningiomas



Methods

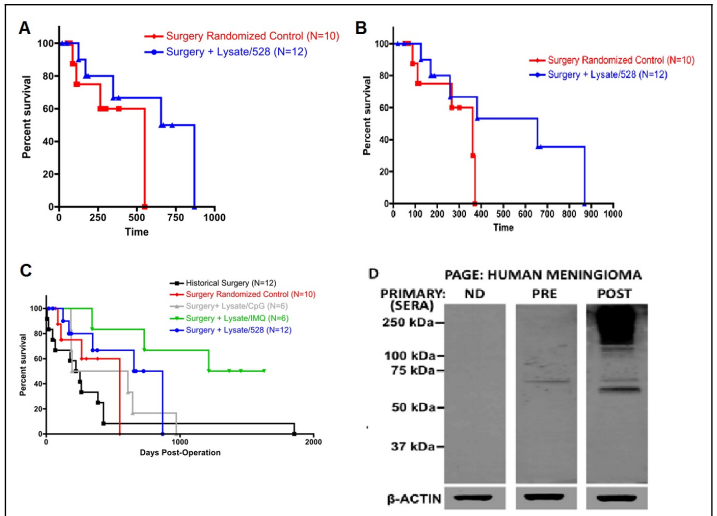
At our institution, we had 34 dogs that were diagnosed histopathologically with meningioma. 22 were treated with either surgery with vaccine immunotherapy or surgery alone. Dogs treated with immunotherapy received a total of 6 vaccines made of autologous tumor lysate and adjuvant 528 (a combined toll-like receptor 7/8 compound). These vaccines were started 2 weeks post operatively at suture removal and were given once every 2 weeks following. MRIs were performed at 6 months post-operatively and when clinically indicated to monitor for recurrence.

Treatment schedule and follow-up MRIs



Results

Therapy was well tolerated and only one dog had an adverse reaction of abscess formation at the site of vaccine administration. 1 dog that had received immunotherapy developed a recurrence as opposed to 3 dogs that had surgery alone. The average survival was 368 days in the immunotherapy group and 224 in the surgery alone group.



A) Overall survival; B) Progression free survival; C) Overall survival for all treatment arms; D) Post vaccination canine serum recognizes human meningioma tissue.

Conclusions

Canines are a relevant model for testing novel therapies against aggressive forms of meningiomas and vaccine immunotherapy can be an effective form of treatment. We found that tumor-reactive antibodies bound both allogeneic canine meningiomas as well as human meningiomas, suggesting common antigens across breeds and species. Further discovery of surface antigens present on tumor cells would allow development of an off-the-shelf vaccine for aggressive meningiomas.

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