Survey of owners of dogs with prostate carcinoma for identification of risk factors

Margaret V. Root Kustritz
University of Minnesota College of Veterinary Medicine, St Paul, MN

Abstract

Fifty owners of dogs with prostate carcinoma were sent questionnaires to identify risk factors for development of disease. Response rate was 68.1%. The population was not shown to be unique in regards to occurrence of neoplasia in related dogs, occurrence of other disease in affected dogs, age at castration, diet, activity level, housing, or exposure to tobacco smoke.

Keywords: Prostate, neoplasia

Introduction

Prostatic carcinoma is an uncommon, high morbidity, high mortality tumor in dogs. Risk factors other than intact status have not been identified in dogs.

Prostatic neoplasia in humans occurs as two distinct stages, a hormone-dependent phase followed by a more invasive, androgen-independent phase. In humans, risk factors for development of malignant prostatic neoplasia include age, genetics, and intact status. About one-third of men aged 50 years have some degree of neoplastic change in their prostate and over 90% of men aged 90 years or more have neoplastic change in their prostate.[1] Up to 10% of prostatic tumors in men are considered to have a hereditary component, with increased incidence in men with an affected father or brother.[2,3] In dogs, breed risk was identified in several studies.[4-6] However, prostatic neoplasia is not listed as a hereditary disorder in the Canine Inherited Disorders Database.[7] In men, the risk due to intact status is increased in those who have never had significant androgen exposure, either because of prepuberal castration or congenital hypogonadism, and is decreased in those who have gone through puberty and have normal serum concentrations of testosterone and dihydrotestosterone.[8] Castration has been identified as a risk factor for prostatic neoplasia in older dogs.[4-6,9-11]

Discussion on this topic at the Society for Theriogenology annual meeting in 2010 led to a consensus that a survey of owners of dogs with prostatic carcinoma might be one way to help us identify potential risk factors worthy of further study.

Materials and methods

Medical records were identified as previously described.[12] Surveys were sent by surface mail to the owners of 50 dogs having confirmed cases of prostatic neoplasia without accompanying prostatic disease. The owners had given their permission to be contacted Questions that were asked are listed in the table.

Results

Three surveys were returned by the postal service. Of the 47 successfully mailed, 32 were returned for a response rate of 68.1%.

Dogs with prostatic neoplasia were 10.2 ± 1.9 years of age at the time of admission and 26 breeds were represented. None of the dogs were intact at the time of diagnosis. At the time of the survey, two of the dogs were still alive and were receiving palliative therapy.

Responses to the questions are listed in the table. General comments about topics not included in the questionnaire were concerns about water source, exposure to flea/tick products, and possible association with dogs being inside for long periods of time without permitting them to urinate.

Discussion

Results of this survey suggest that the questions asked have not identified factors which might make these dogs a unique population. Limited information was available to owners regarding possible heritability of this condition. Because breed predisposition has been identified, veterinarians may wish to

counsel owners against continuing to use fresh or stored semen from males or to breed to bitches that have produced affected offspring. These efforts are hampered by late onset of the disease.

The majority of the dogs in this study were castrated at three years of age or younger. This is in agreement with demographic data suggesting most dogs in the United States that are castrated undergo surgery at less than four years of age, with the greatest increase in number castrated between six and 12 months of age.[13] In studies documenting castration as a risk factor for development of prostatic neoplasia, age at castration was not specifically correlated with either increased or decreased risk of disease. Percentage of dogs that were castrated varied greatly among studies and many dogs underwent castration late in life as one component of treatment for prostate disease, clouding ability to draw firm conclusions. Prostatic carcinoma in dogs is of ductal-urothelial origin; these are androgen-independent tissues.[11,14,15] It may be that castration and subsequent removal of androgen and possibly non-androgen secretory products of the testes is a component of tumor initiation or progression, either as a promoter or via removal of inhibition. It has been shown that prostatic neoplasms from castrated dogs are more anaplastic than are those from intact dogs; frequency and pattern of metastases may or may not vary between these groups.[5,9] At present, it can be stated that castration is not preventative against development of prostatic neoplasia and that lifelong exposure to androgens or non-androgen secretory products of the testes is not required for initiation or progression of prostatic neoplasia.

Most dogs in this study were fed commercial dry food and were moderately active. Again, this agrees with the literature; most dogs in the United States are fed commercial dry food and are considered by their owners to be moderately to very active.[16]

The owners reported that their dogs were of normal weight. Several studies have demonstrated that owners tend to rate their animals as normal weight even though their veterinarian deemed those animals to be overweight, with lack of agreement in up to 44.1% of cases.[17,18] Body condition scoring data were not available for all dogs in the electronic medical record in this study, and many different clinicians performed the body condition scoring, making it a less consistent measure. Since castration is a risk factor for obesity, if the owner perception is correct, this is a population of castrated dogs of normal weight, which is unusual compared to the general population of castrated dogs.[19,20] It is not clear how being of normal weight could be a risk factor for neoplasia. The lack of obesity in this population may be due to the owner-reported activity level of this population or to weight loss secondary to prostatic disease.

One could argue that castrated dogs live longer than intact dogs so predisposition to neoplasia is only due to increased longevity of these animals. Studies do not agree regarding longevity of castrated versus intact dogs, with lack of statistical significance often attributed to wide standard deviation in the two groups.[21-23] Mean age at time of death or euthanasia of castrated dogs is 9.9-10.8 years, while mean age at time of death or euthanasia of intact dogs is 6.2-10.9 years.[21-23] Mean age at time of diagnosis of prostatic neoplasia is about 10.0 years.[5,10,11,24] Finally, studies do not agree as to whether or not intact dogs develop prostatic neoplasia earlier or later in life than do castrated dogs, with one study supporting that hypothesis and other studies refuting it. [5,6,9,11]

Environmental concerns were not demonstrated to be risk factors in this study. There is little information about exposure to tobacco smoke or other environmental irritants as a cause of neoplasia in dogs.[25] There is no information in the literature regarding exposure to substances in water that may be associated with neoplasia. Thirty-six surveys were sent to addresses in suburbs of a large metropolitan area, suggesting most of the dogs would be drinking tested city water, not well water. Reports of increased incidence of neoplasia due to exposure to flea and tick products are based on historical concerns about increased transitional cell carcinoma after exposure to flea and tick dips and shampoos.[25] There are no reports of neoplasia associated with currently marketed flea and tick products.[26] Recent identification of prostatic neoplasia in a 2200-year-old human mummy suggests that industrial environmental exposures are not a likely sole cause of disease.[27]

Hypotheses for pathogenesis of neoplasia secondary to induced urine retention include increased urine concentration and crystalluria leading to urinary tract infections, or direct induction of inflammation, and persistent exposure to toxins excreted in urine with decrease micturition frequency.[25] There are documented associations between inflammation and neoplasia in the human literature.[28]

However, in human medicine, chronic prostatic inflammation is more commonly associated with benign disease than with malignant transformation of tissue.[29]

Conclusion

Results of this study do not provide guidance as to likely risk factors associated with increased incidence of prostatic neoplasia in dogs. Further work should perhaps be directed at identifying changes in prostate histomorphology and function secondary to the endocrine changes and subsequent prostatic atrophy associated with castration in dogs.

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Table: Responses to owner questionnaire regarding possible risk factors for prostate carcinoma in dogs

QUESTION	RESPONSES	COMMENTS
Are you aware of any dogs related to [name of dog], male or female, who also suffered from cancer?	Yes = 3 No or unaware of any = 22 Not answered = 7	1 female littermate with cardiac tumor, 1 male littermate with presumed splenic tumor, 1 half-brother with oral melanoma
Was [name of dog] being treated for any other health conditions at the time of diagnosis of cancer?	Yes = 8 No = 19 Not answered = 5	1 each with ruptured mitral valve, seizure disorder, hip dysplasia, mast cell tumor on tongue and bladder stones, crystalliuria and chronic UTI, benign skin masses, oral osteosarcoma, endocrine disease and dermatitis
At what age was your dog castrated?	Less than one year = 19 1-3 years = 8 3-6 years = 1 6-9 years = 1 More than 9 years = 0 Unknown = 2 Not answered = 1	Exact ages known were: 3 months = 1 4-5 months = 1 6 months = 7 9 months = 1 24 months = 1
What diet was your dog fed for most of his life?	Commercial dry food = 34 Commercial canned food = 3 Homemade diet = 0 Human food = 3 Not answered = 1	Fifteen different foods were listed. Those most commonly fed were Iams (n=8), Science Diet (n=5), and prescription diets from the veterinarian (n=3)
What was your dog's general body condition during most of this lifetime?	Underweight = 0 Normal weight = 26 Overweight = 5 Not answered = 1	
What was his general activity level?	Hunting dog = 2 Very active house pet = 14 Regular walks = 8 Inactive house pet = 7 Not answered = 1	
Was he housed with other animals?	Yes = 23 No = 8 Not answered = 1	13 with at least one dog, 5 with at least one cat, 4 with at least one dog and cat, 1 with dogs and a bird
Where was [name of dog] most commonly housed?	Indoors = 28 Outdoors in covered facility = 1 Outdoors in open facility = 0 Indoors with outside run = 2 Not answered = 1	
Were tobacco products smoked in the household during his lifetime?	Yes = 2 No = 28 Not sure (recently adopted) = 1 Not answered = 1	