

Best age for spay and neuter: a new paradigm

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Abstract

In small animal practice, neutering (including spaying) males and females at about 6 months has become standard. Using our extensive computerized case record system of the veterinary hospital, with currently about 60,000 cases per year, we launched a 10 year project to provide breed-specific and gender-specific, data-based information on joint disorders and certain cancers in dogs associated with neutering at ≤ 6 months, 6 - 11 months, $1 \leq 2$ years and 2 - 8 years. Our 3 published studies on the Golden Retriever, Labrador Retriever, and German Shepherd Dog reveal an increase in the incidence of a joint disorder with neutering done within the first year to 2 - 4 times that of the 3 - 5% incidence of intact dogs. In Golden Retriever females, neutering at any age was associated with an occurrence of one of the cancers followed to 3 - 4 times that of the 3 percent incidence of intact females. The overall project, just completed, includes data and analyses on 35 breeds and 5 weight categories of mixed breed dogs. Considering joint disorders, it is evident that the vulnerability to early neutering similar to the retrievers is related to body size, with small dog breeds showing no vulnerability. The increased risks of cancers with neutering, is breed specific, except that small dog breeds are generally not affected. The rather striking differences among breeds associated with neutering provides a strong rationale for taking into account breed and gender in advising clients about the appropriate age for spay or neuter of a puppy.

Keywords: Neutering, spaying, joint disorders, cancers

In the US¹ and increasingly in much of Europe, the practice of neutering male and spaying female dogs (referred to as neutering) has become routine and is increasingly being performed at ~ 6 months of age. In fact, in veterinary small animal practice, one could argue that neutering at 6 months has become a standard, with an abundance of low-cost clinics offering this service to dog owners in general.

However, during the past decade, investigations have shown that the debilitating joint disorders of hip or elbow dysplasia and cranial cruciate ligament tears or ruptures may increase in association with neutering of male and/or female dogs.^{2,3} Other studies have shown that some cancers, particularly hemangiosarcoma,^{4,5} lymphoma,⁶ and mast cell tumors,⁷ have increased in association with neutering in some male and female dogs. Other studies, focusing on occurrence of multiple cancers, revealed that the reported incidence of cancers in Vizslas was higher in neutered than intact dogs,⁸ whereas a study utilizing the Veterinary Medical Database concluded neutered males and females were more likely to die of a cancer than intact dogs.⁹ However, none of these studies focused on age of neutering.

Given major morphological and physiological differences between breeds, it is only logical that if neutering would have an effect on the likelihood of a disease occurrence that some breeds would be affected but not others. However, the investigations on neutering and certain diseases cited above have generally pooled data from several breeds, the 2 genders, and/or the age of neutering, and thus offer no useful information with regard to determining the best age for neutering a dog of a particular breed to avoid increasing the likelihood of a serious or debilitating disease.

The project at our center set out to provide breed-specific, gender-specific, data-based information on joint disorders, the cancers mentioned in the above studies, mammary cancer, pyometra and urinary incontinence, associated with neutering at various ages (≤ 6 months, 6 - 11 months, $1 \leq 2$ years and 2 - 8 years). We utilized the extensive computerized case record system going back to 2010. With a single case record system, the same diagnostic criteria were applied to all analyses.

Published findings include 3 popular breeds: the Golden Retriever ($n = 1,247$),^{10,11} Labrador Retriever ($n = 1,933$)¹¹ and German Shepherd Dog ($n = 1,257$).¹² In all 3 breeds, there was an increase in the incidence of 1 or more of the joint disorders associated with neutering done in the first year in males and females to 2 - 4 times that of the 3 - 5 percent incidence of intact dogs. The increase in risks in 1 or more of the cancers followed was quite pronounced in female Golden Retrievers, where neutering at any

age was associated with an occurrence of 1 or more of the cancers followed that was 3 - 4 times that of the 3 percent incidence of intact females. In contrast, with male Golden Retrievers, and male and female Labrador Retrievers and German Shepherd Dogs, there was no increase in cancers above that of the dogs left intact. Results in these 3 breeds are a representation of the variability in the occurrence of joint disorders and cancers that we found in many of the other breeds subsequently examined.

Our large project just completed, and pending publication, includes data and analyses on 32 additional breeds (including 3 varieties of Poodles) and 5 weight categories of mixed breed dogs. The final list of breeds are: Australian Cattle Dog, Australian Shepherd, Beagle, Bernese Mountain Dog, Border Collie, Boston Terrier, Boxer, Bulldog, Cavalier King Charles Spaniel, Chihuahua, Cocker Spaniel, Collie, Corgi (both breeds combined), Dachshund, Doberman Pinscher, English Springer Spaniel, German Shepherd Dog, Golden Retriever, Great Dane, Irish Wolfhound, Jack Russell Terrier, Labrador Retriever, Maltese, Miniature Schnauzer, Pomeranian, Poodle-Toy, Poodle-Miniature, Poodle-Standard, Pug, Rottweiler, Saint Bernard, Shetland Sheepdog, Shih Tzu, West Highland White Terrier, and Yorkshire Terrier.

For the mixed breed dogs, weight categories were: small < 10 kg (< 22 lbs), medium 10 - 19 kg (22 - 42 lbs), standard 20 - 29 kg (43 - 64 lbs), large 30 - 39 kg (65 - 86 lbs) and giant 40+ kg (87+ lbs).

Joint disorders examined were: hip dysplasia, cranial cruciate ligament tear or rupture, and elbow dysplasia and cancers were lymphoma (lymphosarcoma), hemangiosarcoma and mast cell tumor. Mammary cancer, pyometra and urinary incontinence were examined in female dogs. Diseases were tracked in dogs left intact and in those neutered in these age ranges: < 6 months, 6 - 11 months, 1 year (12 - 23 months), and 2 - 8 years. The diseases were tracked through 11 years of age or until last seen at the hospital. The computerized hospital record system, with currently > 60,000 cases admitted per year, provided the dataset. The hospital serves as a primary care facility, as well as being a secondary and tertiary facility. The statistical evaluations, with standardized diagnostic criteria applied to various diseases, required a large database with a computerized record system. The study focused on proportional differences in disease occurrence between neuter age groups and intact dogs. Survival analysis was used to test for differences with respect to the hazard of a disease in the neutered and intact groups, adjusting for the differences in time at risk. A two-tailed statistical level of significance was set at $p < 0.05$. Although each breed was analyzed separately, with no statistical comparisons between breeds, overall findings with each breed or mixed-breed group allow for some general comparisons.

Considering the occurrence of joint disorders among all the breeds, it is evident that the vulnerability to early neutering is related to body size, as seen when comparing small-dog breeds, such as the Chihuahua, Pomeranian, or Yorkshire Terrier to dogs of larger breed size. The generalization about body size also applies to dogs of the mixed-breed categories. Another general finding was that the increased risks of cancers with early neutering, such as reported in the Golden Retriever, and seen in some other breeds, including the Border Collie, Boston Terrier, and Boxer, appear to apply to purebred dogs and not to mixed-breed dogs, where there was no significant relationship between neutering and cancer occurrence. In the small-dog breeds, with the exception of the Shih Tzu, there was no association between cancer incidence and spaying at any age.

While only a proportion of AKC registered dog breeds could be covered in our project, the complete data set will soon be available and clinicians then can, in many instances, extrapolate some guidelines for a breed not covered by reviewing results with related breeds and mixed breed weight categories. This rule will apply most aptly to debilitating joint disorders. The findings can also be used for shelters that wish to practice neutering on the principle that it is best for the long-term health of the dogs being adopted, where with small dogs the age of neutering makes no difference, but with large dogs some consideration could be given to allowing delaying of neutering until 1 (or sometimes 2) years of age.

Conclusion

The rather striking differences among breeds with regard to vulnerability in the increase in joint disorders and some cancers associated with neutering of male and female dogs provides a strong rationale for taking into account breed and even the gender, in advising clients about the appropriate age for spay

or neuter of a puppy. In conclusion, the time has come to adopt a new paradigm for spaying and neutering dogs that is based on benefiting the long-term health and welfare of the specific canine companion in question.

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Conflict of interest

Authors have no conflict of interest to declare.

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