

Another Option for Canine Sterilization: Ovary-Sparing Hysterectomy

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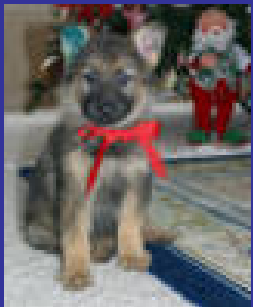
Outline

- Benefits of routine, post-pubertal ovariohysterectomy (or ovariectomy)
- Short-term risks of routine, post-pubertal ovariohysterectomy (or ovariectomy)
- Long-term risks of routine, post-pubertal ovariohysterectomy (or ovariectomy)
- Another option: ovary-sparing hysterectomy



Benefits of OHE

- Prevention of pregnancy (sterilization)
 - Since large-scale efforts went into effect in 1970, the number of unwanted cats & dogs euthanized at animal shelters has decreased from an estimated 23.4 million to ~4.5 million in 2000
 - » Clancy, EA. Rowan, AN. Companion Animal Demographics in the United States: A Historical Perspective. In: The State of the Animals II: 2003eds. Salem, DJ, Rowan, AN. Washington D.C.: Humane Society Press, 2003;9-26.





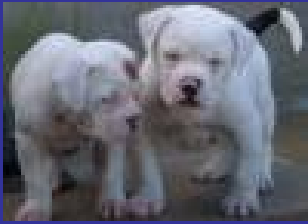
Benefits of OHE

- Prevention (or reduction in the risk) of mammary tumors
 - 0.5% if spayed before the 1st heat
 - 8% if spayed before the 2nd heat
 - 26% if spayed after the 2nd heat
 - » Schneider, R. et al. Factors influencing canine mammary cancer development and postsurgical survival. J Natl Cancer Inst 1969;43:1249-1261



Benefits of OHE

- Prevention of ovarian & uterine cancers
 - Of all canine tumors, very uncommon
 - Ovarian tumors: 6.25%
 - Uterine tumors: <0.5%
 - » Klein, MK. Tumors of the female reproductive system. In: Withrow and MacEwen's Small Animal Clinical Oncology. 4th ed. Eds. Winthrow, SJ. Vail, DM. St. Louis. WB Saunders Elsevier. 2007;610-618.
 - Little reliable information exists regarding the mortality associated with these tumors



Benefits of OHE

- Prevention of pyometra
 - A study in Sweden, where elective spaying is rarely practiced, found that overall 25% of the females developed pyometra by 10 years of age
 - Risk varied considerably by breed, with some breeds having a 10% rate of pyometra & others up to 50%
 - » Egenvall, A. et al. Breed risk of pyometra in insured dogs in Sweden. J Vet Intern Med 2001;15;530-538.

Short-Term Risks of OHE

- Complication rates: 2.6%-20%
- Anesthetic complication
- Hemorrhage (bleeding)
- Infection
- Dehiscence
- Other



Long-Term Risks of OHE

- Obesity
 - Increased appetite & decreased metabolism
- Stump granuloma
- Ovarian remnant \pm stump pyometra
- Other



Urinary Incontinence

- Incidence: 5-50%
 - Higher in medium & large breed dogs (>30 lb)
 - Age at time of spaying does not affect likelihood of developing incontinence

Evaluation of the prevalence of urinary incontinence in spayed female dogs: 566 cases (2003–2008)

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Katharine R. Salmeri, DVM, DACVS; Richard P. Bastian, PhD

Objective—To determine the prevalence of urinary incontinence in spayed female dogs and categorize affected dogs by age at time of ovariohysterectomy, number of litters prior to ovariohysterectomy, body weight, treatment of affected dogs, and severity of incontinence and to determine associations among these variables.

Design—Retrospective case series.

Animals—566 ovariohysterectomized dogs.

Procedures—An attempt was made to contact owners of 912 dogs ovariohysterectomized between January 2003 and January 2008 to discuss presence or absence of urinary incontinence. The actual number of responders was 566. Those owners with incontinent pets received a questionnaire further assessing degree of incontinence, diagnostic testing, treatment, and history.

Results—The prevalence of acquired urinary incontinence was determined to be 5.12% (29/566 dogs) on the basis of results of phone surveys and questionnaires. There was no significant difference in the age at time of ovariohysterectomy between incontinent and continent groups. A significant association was found between body weight and incontinence, with incontinence rates higher among larger (≥ 15 kg [33.1 lb]) dogs. Larger dogs were approximately 7 times as likely (OR, 7.2 [95% confidence interval, 2.5 to 21.1]) to develop acquired urinary incontinence, compared with small dogs (< 15 kg).

Conclusions and Clinical Relevance—Although acquired urinary incontinence in female dogs is known to be associated with ovariohysterectomy, the prevalence in this study was low. (*J Am Vet Med Assoc* 2013;242:958–962)

Behavior Problems



- Though neutering has been associated with a decreased incidence of some kinds of aggression, there is evidence that it may sometimes be associated with an increase in aggressive behavior
 - Increase in aggression towards owners of spayed female dogs who were spayed before 11 months of age & who had already showed some aggressive behaviors before spaying
 - » O'Farrell, V. Peachy, E. Behavioural effects of ovariectomy on J Sm Anim Pract 1990;31:595-598.



Behavior Problems

- English Springers

- More owner-directed aggression reported in neutered dogs than in intact dogs

- » Reisner, IR. Houpt, KA. Shofer, FS. National survey of owner-directed aggression in English Springer Spaniels. JAVMA 2005;227(10);1594-1603

- Female German Shepherds who were neutered were more reactive to the presence of unfamiliar humans & dogs than were intact dogs

- » Kim, HH. et al. Effects of ovariectomy on reactivity in German Shepherd dogs. Vet J 2006;172(1);154-159

Orthopedic Disease

- Rupture of the cranial cruciate ligament (CCL)
 - Common problem of large breed dogs
 - Reported incidence of 1.8%-4.5%, though the incidence in predisposed breeds has been reported to be as high as 8.9%
 - In addition to breed & obesity, spaying increases the risk of CCL rupture
 - » Whitehair, JG. Vasseur, PB. Willits, NH. Epidemiology of cranial cruciate ligament rupture in dogs. JAVMA 1993;203(7);1016-1019
 - » Duval, JM. et al. Breed, sex, and body weight as risk factors for rupture of the cranial cruciate ligament in young dogs. JAVMA 1999;215(6);811-814.
 - » Slauterbeck, JR. et al. Canine ovariohysterectomy and orchiectomy increases the prevalence of ACL injury. Clin Orthop Relat Res 2004;429;301-305
 - » Aragon, CL. Budsberg, SC. Applications of evidence-based medicine: cranial cruciate ligaments injury repair in the dog. Vet Surg 2005;34(2);93-98
 - » Canapp, SO. The canine stifle. Clin Techn Sm Anim Pract 2007;22(4);195-205.
 - » Duerr, FM. et al. Risk factors for excessive tibial plateau angle in large breed dogs with cranial cruciate ligament disease. JAVMA 2007;231(11);1688-1691.
 - » Witsberger, TH. et al. Prevalence of and risk factors for hip dysplasia and cranial cruciate ligament deficiency in dogs. JAVMA 2008;232(12);1818-1824



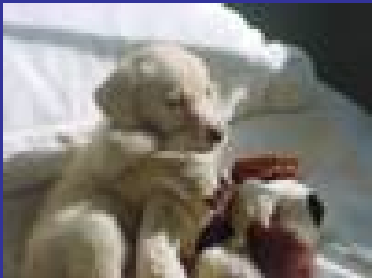


Orthopedic Disease

- Hip dysplasia
 - Developmental abnormality of the hip joint that can result in arthritis & debilitating pain
 - Incidence as high as 40%-75% in large breed dogs
 - The incidence of hip dysplasia is most strongly associated with breed and family history
 - Some studies have identified spaying as a risk factor for hip dysplasia
 - » Witsberger, TH. et al. Prevalence of and risk factors for hip dysplasia and cranial cruciate ligament deficiency in dogs. JAVMA 2008;232(12);1818-1824
 - » van Hagen, MA. et al. Incidence, risk factors, and heritability estimates of hind limb lameness caused by hip dysplasia in a birth cohort of boxers. Am J Vet Res 2005;66(2);307-312

Osteosarcoma

- Bone cancer
 - Most common in large & giant breed dogs
 - Overall incidence varies from 0.2% - 12.5%
 - Neutered dogs have been reported to be at higher risk
 - » Ru, G. Terracini, B. Glickman, LT. Host related risk factors for canine osteosarcoma. Vet J 1998;156(1);31-9.



Endogenous Gonadal Hormone Exposure and Bone Sarcoma Risk¹

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Introduction

Osteosarcoma is the most frequently diagnosed bone tumor of adolescents and young adults (1–3). To date, little is known concerning etiology and risk factors for osteosarcoma. Limited geographic variation in the incidence of osteosarcoma suggests the importance of host factors such as gender or skeletal growth (4). Age-specific incidence data indicate an association be-

Methods

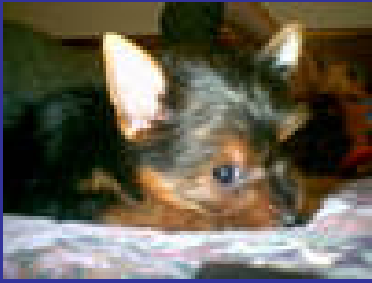
- Data were collected by questionnaire from owners of 683 Rottweiler dogs living in North America
- To determine whether there was an association between endogenous sex hormones & risk of bone sarcoma, relative risk (RR) of incidence rates & hazard ratios for bone sarcoma were calculated for dogs subdivided on the basis of lifetime gonadal hormone exposure

Results

Table 4 Lifetime gonadal hormone exposure and bone sarcoma risk in a cohort of 683 Rottweiler dogs

	Dogs with bone sarcoma (no.)	Dogs without bone sarcoma (no.)	Total dog-months	Bone sarcoma incidence rate (95% CI) ^a	RR (95% CI)	P
Total population	86	597	71,004	12.1 (9.6–14.7)		
Gender						
Male	35	259	30,228	11.6 (7.8–15.4)	1.0	
Female	51	338	40,776	12.5 (9.1–15.9)	1.1 (0.7–1.7)	0.74
Male gonadal exposure subgroup						
Castrated before 1 yr of age	9	25	3,168	28.4 (9.8–47.0)	3.8 (1.5–9.2)	0.002
Castrated 1–3.5 yr of age	8	57	6,228	12.8 (3.9–21.8)	1.7 (0.7–4.3)	0.31
Castrated after 3.5 yr of age	8	57	7,632	10.5 (3.3–17.8)	1.4 (0.6–3.5)	0.48
Sexually intact	10	120	13,212	7.6 (2.9–12.3)	1.0	
				<i>P</i> trend = 0.008		
Female gonadal exposure subgroup						
Spayed before 1 yr of age	18	57	7,176	25.1 (13.5–36.7)	3.1 (1.1–8.3)	0.02
Spayed 1–5 yr of age	14	108	12,612	11.1 (5.3–16.9)	1.4 (0.5–3.8)	0.63
Spayed after 5 yr of age	14	108	14,856	9.4 (4.5–14.3)	1.2 (0.4–3.2)	1.00
Sexually intact	5	64	6,144	8.1 (1.0–15.3)	1.0	
				<i>P</i> trend = 0.006		

^aIncidence rate expressed as number of bone sarcomas per 10,000 dog-months.



Conclusions

- Bone sarcoma was diagnosed in 12.6% of dogs in this study group
- Risk for bone sarcoma was significantly influenced by age at gonadectomy
 - Male & female dogs that underwent gonadectomy before 1 year of age had an ~ 1 in 4 lifetime risk for bone sarcoma & were significantly more likely to develop bone sarcoma than dogs that were sexually intact
 - Males: RR 95% CI 3.8 (1.5- 9.2)
 - Females: RR 95% CI 3.1 (1.1- 8.3)

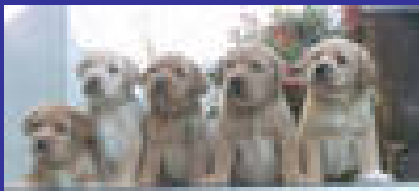
Hemangiosarcoma

- Cancer of the cells that normally form blood vessels
 - Occurs most commonly in the spleen
- Breed predisposition: German Shepherd, Labrador Retriever & Golden Retriever
- Spayed females have 2X the risk of splenic hemangiosarcoma & 5X the risk of cardiac hemangiosarcoma compared to intact females
 - » Prymak, C. et al. Epidemiologic, clinical, pathologic, and prognostic characteristics of splenic hemangiosarcoma and splenic hematoma in dogs: 217 cases (1985). JAVMA 1988;193(6):706-712
 - » Ware, WA. Hopper, DL. Cardiac tumors in dogs: 1982-1995. J Vet Int Med 1999;13;95-103



Transitional cell carcinoma

- Cancer of the lower urinary tract, usually found in the bladder & urethra
- 1%-2% of canine cancers
- More common in females than males, prevalence varies by breed & spayed dogs are at a 2-4X greater risk than intact dogs
 - » Norris, AM. et al. Canine bladder and urethral tumors: A retrospective study of 115 cases (1980-1985). J Vet Int Med 1992;6(3);145-153
 - » Knapp, DW. et al. Naturally-occurring transitional cell carcinoma of the urinary bladder. Urolog Oncol 2000;5;47-59



Neutering Dogs: Effects on Joint Disorders and Cancers in Golden Retrievers

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Abstract

In contrast to European countries, the overwhelming majority of dogs in the U.S. are neutered (including spaying), usually done before one year of age. Given the importance of gonadal hormones in growth and development, this cultural contrast invites an analysis of the multiple organ systems that may be adversely affected by neutering. Using a single breed-specific dataset, the objective was to examine the variables of gender and age at the time of neutering versus leaving dogs gonadally intact, on all diseases occurring with sufficient frequency for statistical analyses. Given its popularity and vulnerability to various cancers and joint disorders, the Golden Retriever was chosen for this study. Veterinary hospital records of 759 client-owned, intact and neutered female and male dogs, 1–8 years old, were examined for diagnoses of hip dysplasia (HD), cranial cruciate ligament tear (CCL), lymphosarcoma (LSA), hemangiosarcoma (HSA), and mast cell tumor (MCT). Patients were classified as intact, or neutered early (<12 mo) or late (≥ 12 mo). Statistical analyses involved survival analyses and incidence rate comparisons. Outcomes at the 5 percent level of significance are reported. Of early-neutered males, 10 percent were diagnosed with HD, double the occurrence in intact males. There were no cases of CCL diagnosed in intact males or females, but in early-neutered males and females the occurrences were 5 percent and 8 percent, respectively. Almost 10 percent of early-neutered males were diagnosed with LSA, 3 times more than intact males. The percentage of HSA cases in late-neutered females (about 8 percent) was 4 times more than intact and early-neutered females. There were no cases of MCT in intact females, but the occurrence was nearly 6 percent in late-neutered females. The results have health implications for Golden Retriever companion and service dogs, and for oncologists using dogs as models of cancers that occur in humans.

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Methods



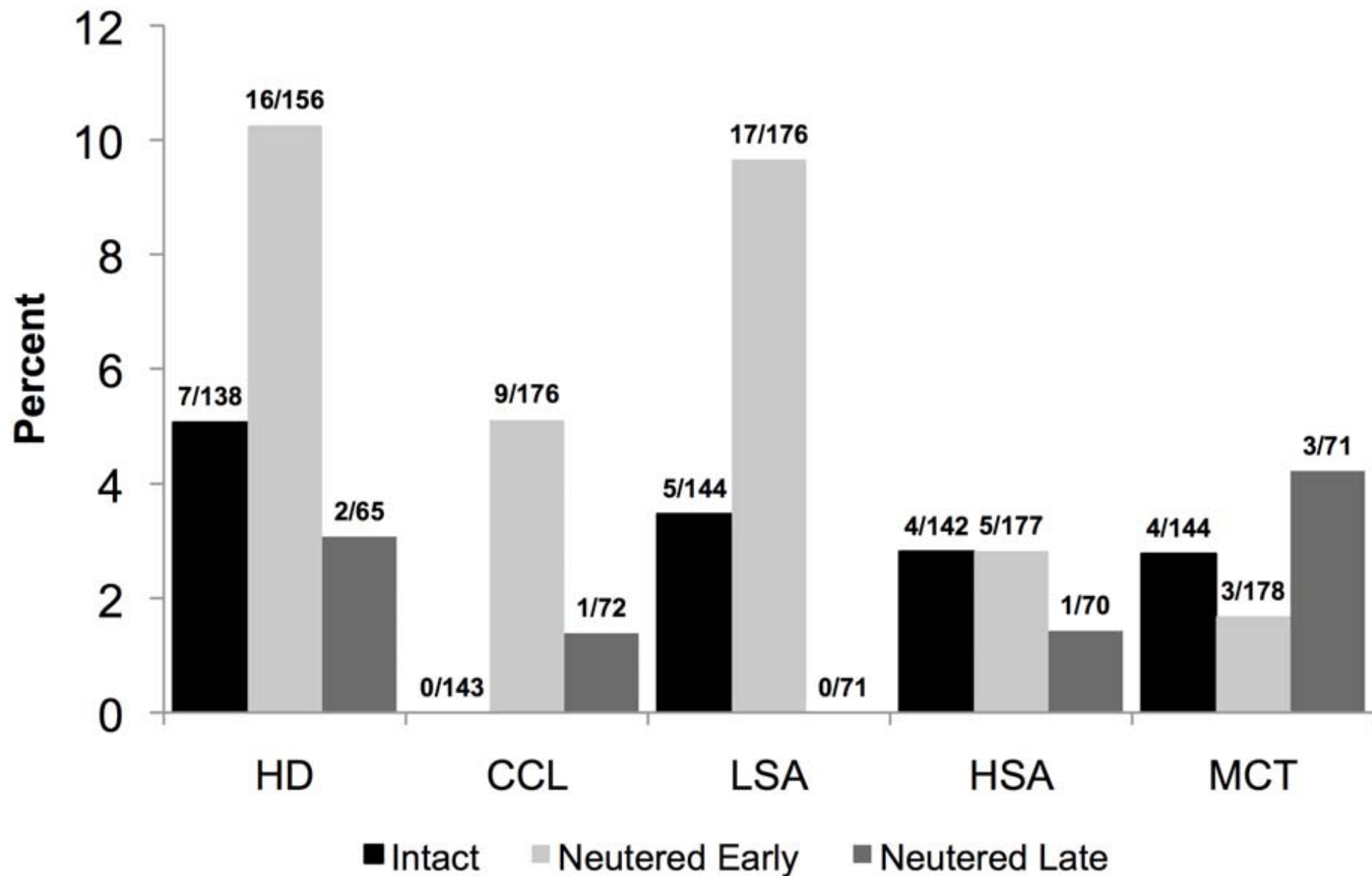
- Records of 759 client-owned, intact & neutered female & male Golden Retriever dogs, ages 1-8 years old, were examined for diagnoses of hip dysplasia (HD), cranial cruciate ligament tear (CCL), lymphosarcoma (LSA), hemangiosarcoma (HSA) & mast cell tumor (MCT)
- Dogs were classified as intact, or neutered early (<12 mo) or late (>12 mo)

Results

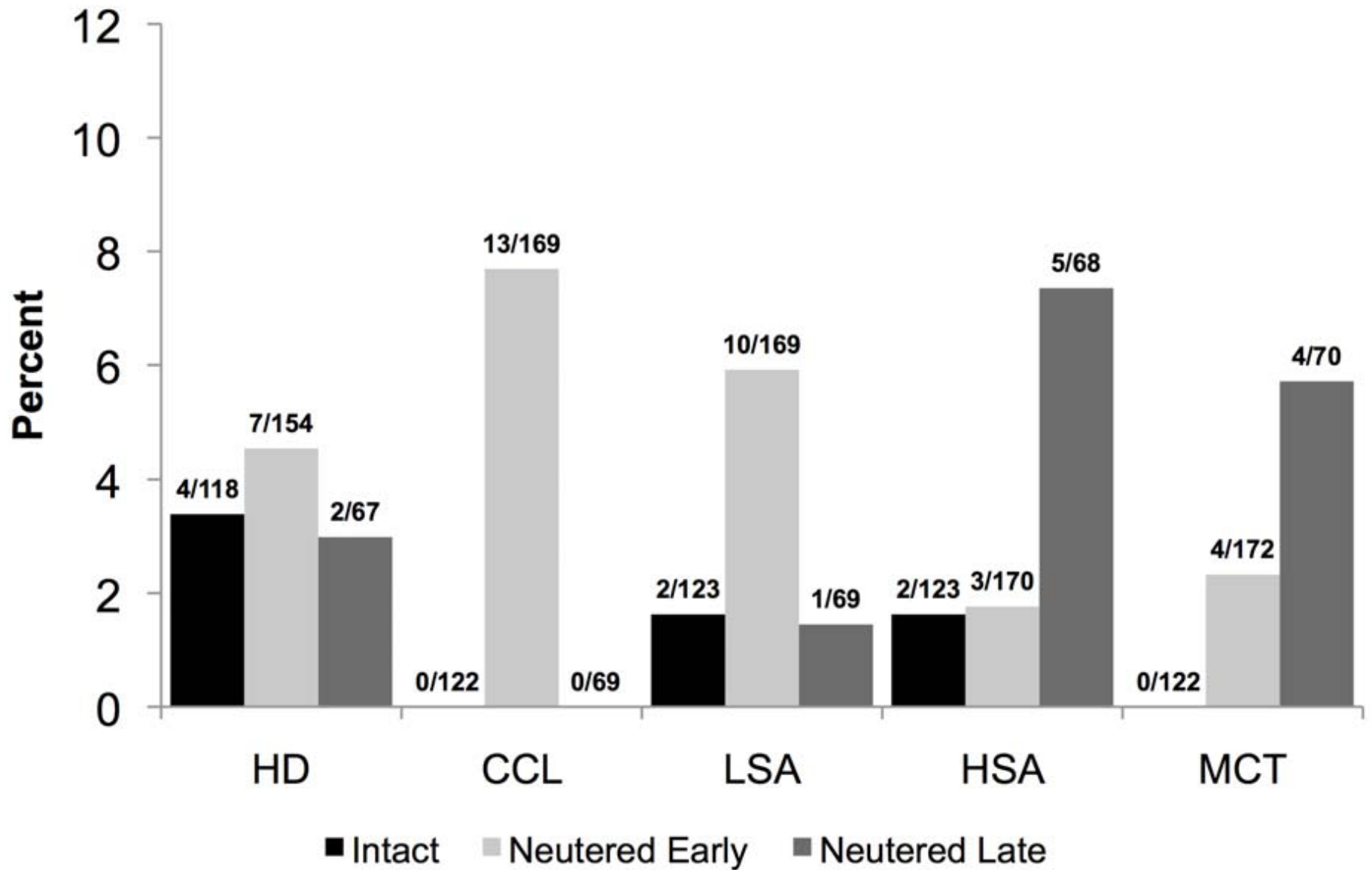


- Orthopedic disease
 - Of early-neutered males, 10% were diagnosed with HD
 - 2X the occurrence in intact males
 - There were no cases of CCL diagnosed in intact males or females, but in early-neutered males & females the occurrences were 5% & 8%, respectively
- Cancer
 - Almost 10% of early-neutered males developed LSA
 - 3X more than intact males
 - HSA in late-neutered females was 4X more than intact females
 - There were no cases of MCT in intact females, but the occurrence was nearly 6% in late-neutered females

Male Golden Retrievers



Female Golden Retrievers



Evaluation of the risk and age of onset of cancer and behavioral disorders in gonadectomized Vizslas

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Lynda D. Ruffini; Tom A. Gibbons, MS; Randall H. Rieger, PhD

Objective—To investigate associations between age at gonadectomy and estimated risk or age at diagnosis of neoplastic and behavioral disorders in Vizslas.

Design—Retrospective cohort study.

Animals—2,505 Vizslas born between 1992 and 2008.

Procedures—Data on demographics, gonadectomy status, and age at diagnosis of disease or disorder were obtained with an anonymous online survey and analyzed.

Results—Dogs gonadectomized at ≤ 6 months, between 7 and 12 months, or at > 12 months of age had significantly increased odds of developing mast cell cancer, lymphoma, all other cancers, all cancers combined, and fear of storms, compared with the odds for sexually intact dogs. Females gonadectomized at ≤ 12 months of age and males and females gonadectomized at > 12 months of age had significantly increased odds of developing hemangiosarcoma, compared with the odds for sexually intact dogs. Dogs gonadectomized at ≤ 6 months of age had significantly increased odds of developing a behavioral disorder. The younger the age at gonadectomy, the earlier the mean age at diagnosis of mast cell cancer, cancers other than mast cell, hemangiosarcoma, lymphoma, all cancers combined, a behavioral disorder, or fear of storms.

Conclusions and Clinical Relevance—Additional studies are needed on the biological effects of removing gonadal hormones and on methods to render dogs infertile that do not involve gonadectomy. Veterinarians should discuss the benefits and possible adverse effects of gonadectomy with clients, giving consideration to the breed of dog, the owner's circumstances, and the anticipated use of the dog. (*J Am Vet Med Assoc* 2014;244:309–319)

Methods



- Records of 2,505 client-owned, intact & neutered female & male Vizslas, ages 1-8 years old, were examined for lymphosarcoma, hemangiosarcoma, mast cell tumor & behavioral disorders (including fear of storms)
- Dogs were classified as intact, or neutered before 6 months, between 7 & 12 months, or after 12 months



Results

- Bitches spayed at all ages had significantly increased odds of developing mast cell cancer, lymphoma, all other cancers & fear of storms compared to intact bitches
- Bitches spayed at or after 12 months of age had significantly increased odds of developing hemangiosarcoma compared to intact bitches

Table 1—Frequency (%) of various conditions in gonadectomized and sexually intact Vizslas.

Condition	Females				Males			
	≤ 6 months	7–12 months	> 12 months	Sexually Intact	≤ 6 months	7–12 months	> 12 months	Sexually Intact
Mast cell cancer	17 (0.7)	10 (0.4)	48 (1.9)	14 (0.6)	8 (0.3)	5 (0.2)	33 (1.3)	13 (0.5)
Hemangiosarcoma	7 (0.3)	5 (0.2)	28 (1.1)	3 (0.1)	0 (0)	3 (0.1)	16 (0.6)	11 (0.4)
Lymphoma or lymphosarcoma	4 (0.2)	3 (0.1)	15 (0.6)	3 (0.1)	4 (0.2)	3 (0.1)	10 (0.4)	4 (0.2)
All other cancers*	35 (1.6)	28 (1.2)	87 (3.9)	21 (0.9)	24 (1.1)	30 (1.3)	55 (2.5)	32 (1.4)
All cancers combined	63 (2.5)	46 (1.8)	174 (7.0)	40 (1.6)	36 (1.4)	40 (1.6)	109 (4.4)	59 (2.4)
Death (all causes)	29 (1.2)	25 (1.0)	122 (4.9)	43 (1.7)	22 (0.9)	26 (1.0)	77 (3.1)	58 (2.3)
All behavioral disorders	40 (1.8)	24 (1.1)	53 (2.4)	86 (3.9)	30 (1.4)	21 (1.0)	44 (2.0)	77 (3.5)
Fear of storms	30 (1.2)	22 (0.9)	57 (2.3)	19 (0.8)	11 (0.4)	17 (0.7)	31 (1.2)	14 (0.6)

Data were obtained from a survey⁷ reported previously. Total number of dogs was not calculated because some dogs had > 1 condition.

*Other than mast cell cancer, hemangiosarcoma, and lymphoma or lymphosarcoma.

Results



- Dogs spayed at 6 months of age had significantly increased odds of developing a behavioral disorder
- The younger the age at spaying, the earlier the age at diagnosis of mast cell cancer, cancers other than mast cell, hemangiosarcoma, lymphoma, all cancers combined, a behavioral disorder, or fear of storms

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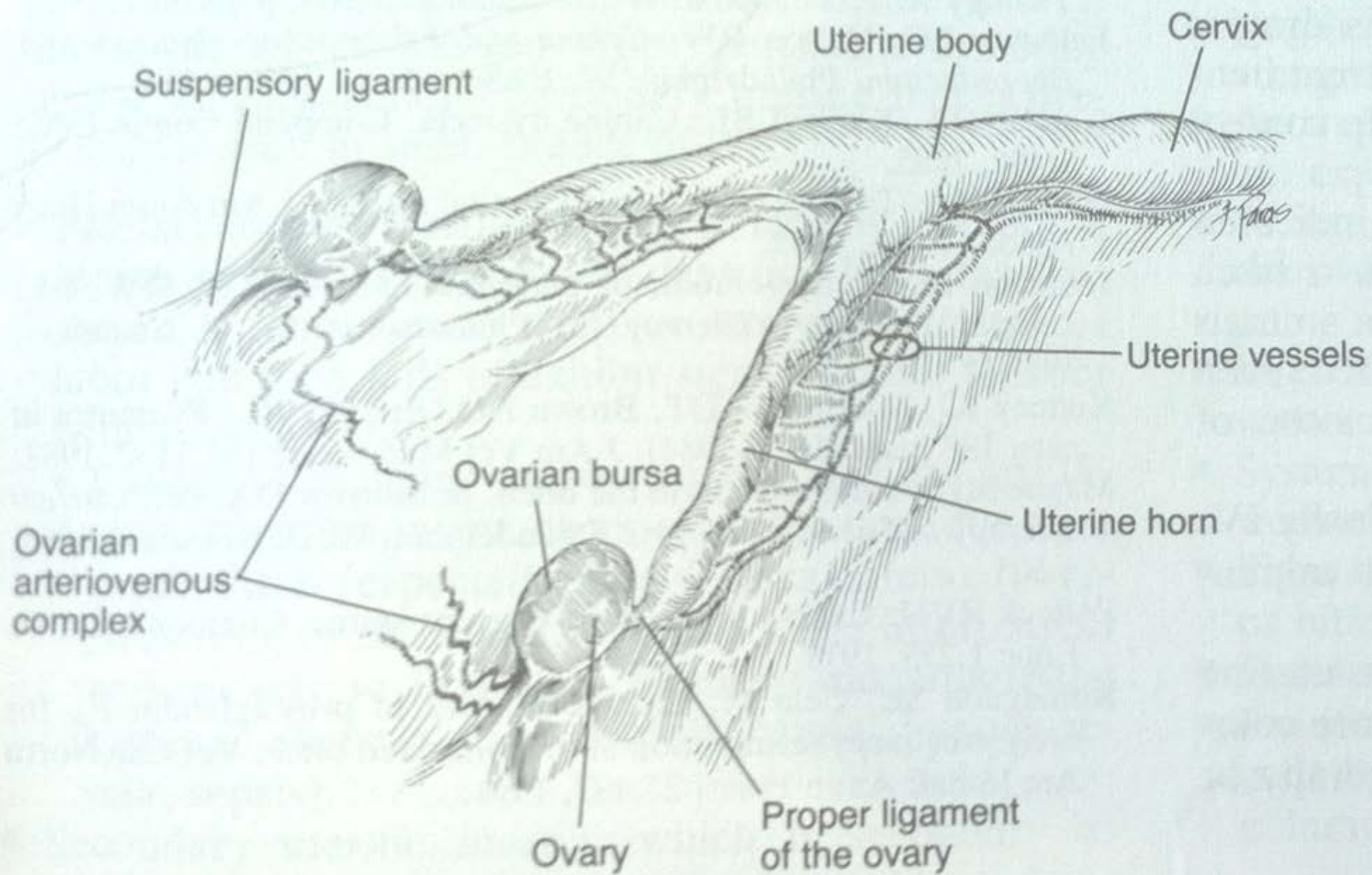
Data were obtained from a survey⁷ reported previously. Total number of dogs was not calculated because some dogs had > 1 condition.

*Other than mast cell cancer, hemangiosarcoma, and lymphoma or lymphosarcoma.

Another Option

- Ovary-sparing hysterectomy
 - Principle
 - Entire uterus is removed
 - Fallopian tubes, uterine horns, uterine body, cervix & part of vagina
 - Ovaries are left



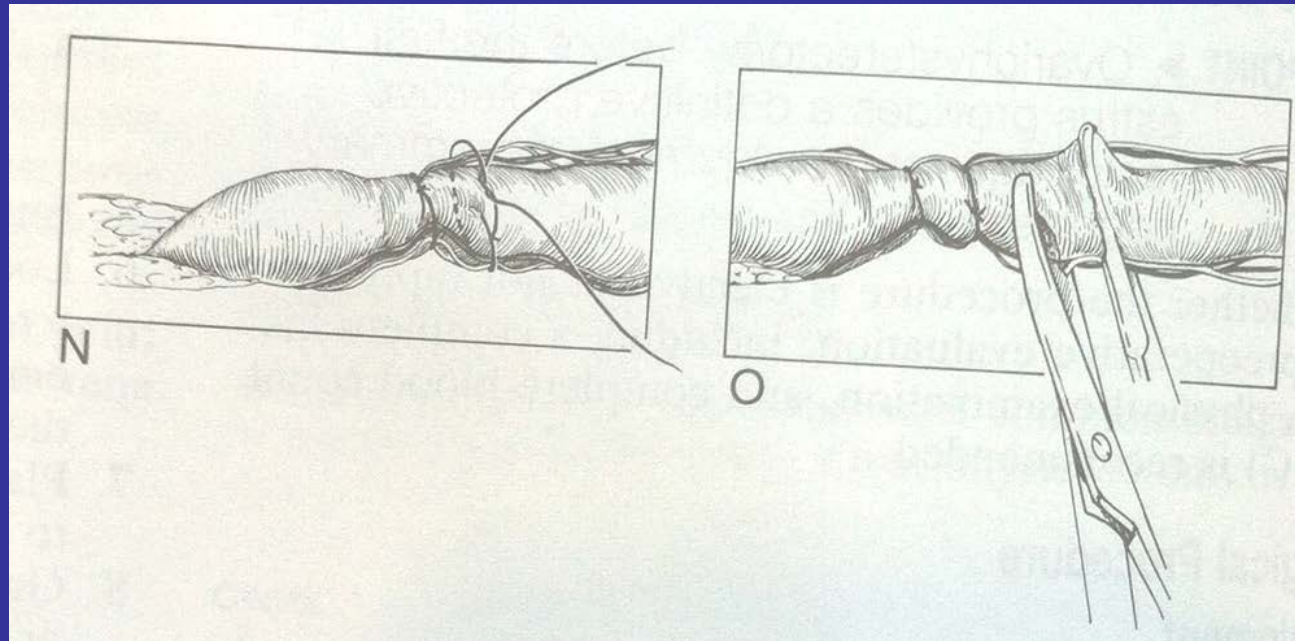
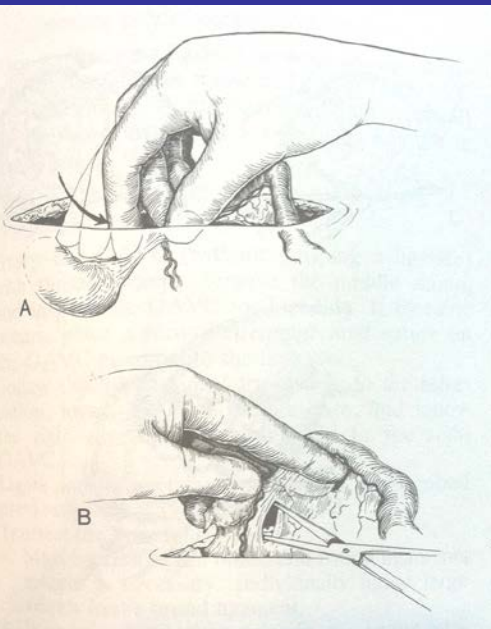


Another Options

- Ovary-sparing hysterectomy

- Surgery

- Similar approach as a traditional spay except the incision needs to be a little longer & further caudal to allow for complete removal of the cervix
 - <http://www.parsemusfoundation.org/ovary-sparing-spay/>



~ Closing Remarks ~

- Traditional ovariohysterectomy still has its place in veterinary medicine but dog owners should be aware of the short- & long-term risks associated with removing the ovaries & then make an educated decision about the lifetime health of their pet

