Growing interest in hormone sparing dog sterilization and recommendations for standard identification methods

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Abstract

Sterilization methods for pets have been around for more than a century, but the practice of spaying and neutering dogs varies globally, from being considered a standard of responsible care in some countries to an infringement of animal welfare in others. In the US, advocacy for spay/neuter programs became widespread in the 1970s to address canine overpopulation. More recently, research on the impact of canine neutering has identified potentially serious health and behavior consequences of removal of the gonads and associated sex hormones that appear to be influenced by sex, breed, age and environment. An alternative is hormone preserving sterilization, including hysterectomy and vasectomy, which allows population control while maintaining natural hormone concentrations. Informal analyses regarding alternatives to traditional spay/neuter indicate that interest from the public and veterinarians has grown in the last 2 years, public demand for veterinarians who offer alternatives is increasing and although most veterinarians acknowledge the pros and cons of gonadectomy, the number providing hormone preserving sterilization is very low. Given current trends toward individualized medicine and increasing public demand, it is likely that the number of practitioners who offer vasectomy, hysterectomy or other hormone reserving sterilization procedures will grow. Now is the time to develop standard methods of identifying dogs who have received such procedures, so that they do not unnecessarily undergo a second surgery. Following an analysis of current practice and available identification methods, we recommend that simple green tattoos be applied to the inguinal area ("X" for hysterectomy and "V" for vasectomy) to identify sterilized dogs.

Keywords: Spay/neuter, hysterectomy, vasectomy, identification, tattoo, hormone sparing

Introduction and history

Sterilization of cats and dogs as a standard part of pet care is a relatively new concept and not practiced widely on a global scale. Neutering a dog or cat usually refers to gonadectomy: castration of males (orchiectomy) and spaying in females (ovariohysterectomy). However, several other methods for ensuring that pets do not reproduce have been developed, which are of increasing interest as we better understand impacts of gonadectomy on health and welfare.

One of the earliest accounts of pet sterilization is an 1893 description of neutering an unanesthetized male cat.[1] During the early 20th century, killing a female's kittens shortly after birth was a customary method of birth control. It was not until the 1930s that spaying and castrating cats was recommended.[1] Lack of safe anesthetics caused greater risk of surgery and pet sterilization remained infrequent until the latter half of the century.

Over time, owning dogs and cats changed from a utilitarian practice to one of companionship. However, increases in number of intact, free-roaming dogs and cats in the US. ultimately resulted in the shelters being overrun with stray animals by the 1960s. In 1973, 13.5 million dogs and cats were euthanized annually by US shelters, equating to ~ 20% of the owned dog and cat populations (65 million).[2] The number of animal shelters continued to grow over time, from a few hundred in the 1960s to 3,500 by 2015.[2]

Sterilizing animals was an obvious method to reduce pet overpopulation; in the US, spay/neuter clinics opened in the 1970s to provide low cost/high volume service. Animal protection organizations supported widespread spay/neuter programs and lobbied for stricter regulations on licensing, control and sterilization of pets. By 2010, a majority of states in US had mandatory spay/neuter laws to address the homeless pet population. In 32 states, animal shelters were required to sterilize dogs and cats prior to releasing them (except animals that were too young or medically unfit for the surgery).[3]

Spay/neuter programs, along with other efforts to address pet overpopulation in the US, successfully reduced dog and cat euthanasia rates as well as shelter intakes, which declined rapidly in the 1970s. By the mid 1980s, euthanasia rates of cats and dogs had decreased to 7.6 - 10 million (or 10% of owned dogs and cats) and shelter intakes were reduced by 50%.[2]

Gonadectomy has become the standard in the US, with over 80% of owned dogs being neutered. Veterinary schools train their students to perform orchiectomy and ovariohysterectomy as common surgical procedures in dogs and cats. However, the practice of neutering pets varies greatly across the world, and in some cultures, it may be considered cruel or harmful. For example, by 2011 as many as 80% of male and female dogs were neutered in the UK but in Germany and Scandinavia it is less common and the practice is often regulated.[4] Yet, a lack of standard sterilization does not always result in serious pet overpopulation. In Norway and Sweden, for example, there are virtually no stray dogs even though neutering is very uncommon, usually only allowable due to an individual health concern.[5] "Responsible pet ownership" instead of spay/neuter is the standard. In the US, animal cruelty laws derive from an agrarian tradition of considering animals as property (to be protected) and contain many exemptions when an action is of utility to the owner.[6] European companion animal legislation, by contrast, aims to protect the animal for its own sake, including provisions not to cause unnecessary harm.[6,7]

Implications of gonadectomy and hormone preserving options

Removal of gonads and associated sex hormones, is known to have significant health and welfare impacts on dogs beyond halting reproduction. On the positive side, gonadectomized dogs are not as likely to have diseases associated with the sex organs, such as mammary, ovarian and testicular cancers, pyometra and prostate disorders.[8] Yet a growing body of research on the outcomes of canine gonadectomy indicate that serious health complications unrelated to sex organs may occur. Obesity, urinary incontinence, various cancers, immune-mediated diseases, musculoskeletal disorders and cognitive and behavior problems are more common in gonadectomized dogs.[8-13] Natural hormone feedback mechanisms become unregulated in neutered dogs. Emerging research indicates that the high levels of unopposed luteinizing hormone likely influence development of diverse health disorders.[14]

The relationships between sex hormones, health and wellness are not simple and may be influenced by many factors, including sex, breed, age and environment. Although additional studies will help to elucidate these interactions, enough information has emerged that dog owners are increasingly seeking other options to control reproduction without impacting natural hormones. Such gonad sparing sterilization options have been known for some time, but are not commonly practiced by veterinarians in the US. For female dogs, the first publication on hysterectomy (also called ovary-sparing spay or partial spay) was an elegant and succinct treatise published in 1972[15] and tubal ligation surgery was reported in 1973.[16] Both surgical procedures preserve the ovary and associated hormones, but complete hysterectomy is usually preferred, since it eliminates the risk of pyometra by removing both the uterus and cervix. For male dogs, the surgical option is vasectomy.

Nonsurgical hormone-preserving options are also of great research interest, especially for resource-limited environments. A recently published study reported successful canine sterilization while preserving testosterone using calcium chloride dihydrate in alcohol injected into the epididymis with ultrasound guidance;[17] dogs retained normal hormone profiles, yet were sterile. Other experimental approaches, such as epididymal ligation or therapeutic ultrasound, have promising results.[18,19] Whereas nonsurgical gonad sparing options will likely become available in the future, highly-informed dog owners are increasingly becoming aware of existing surgical techniques to sterilize while preserving hormones.

Interest in alternative canine contraception

As part of its mission to create meaningful improvements in human and animal health and welfare by advancing innovative and neglected medical research, the Parsemus Foundation has supported research on new sterilization techniques for pets and its website serves as a resource for veterinarians and the public regarding hormone sparing alternatives to traditional spay and neuter.[20] Additionally, the site maintains a free listing service of veterinarians who offer contraceptive options for dogs beyond ovariohysterectomy (spay) and orchiectomy (neuter).[21] The organization is regularly contacted by pet owners looking for a veterinarian in their area who offers hormone sparing methods and by veterinarians who have questions or wish to join the listing service. Enumeration of these contacts from September, 2013 through December, 2018 provided information on the recent trend in interest in options beyond traditional spay/neuter. Total quarterly contacts increased 4 fold by 2017 - 2018 (from 2.9 contacts/quarter in 2013 - 2016 to 12.5 contacts/quarter in 2017 - 2018; Figure 1). This increase likely reflects how the growing number of scientific publications, media placements and internet posts on the topic are translating into public demand and veterinary interest in hormone-sparing methods.

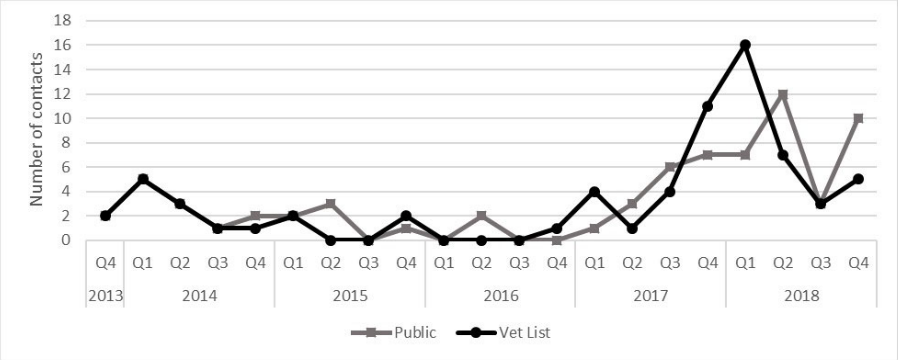

Figure 1. Contacts to the Parsemus Foundation regarding alternatives to traditional spay/neuter from the last quarter of 2013 through the last quarter of 2018. The contacts were via email and included the public seeking a veterinarian or asking questions (grey line) and veterinarians or others registering or updating information on the listing of veterinarians maintained at the website (black line).[21] Contacts increased 427% from 2013 - 2016 to 2017 - 2018.

A social media group (Ovary Sparing Spay and Vasectomy Info Facebook Group) was launched in May 2013 to discuss alternatives to traditional spay and neuter. As of January 28, 2019, the group had 13,553 members (8,500 active), with 72% of the members from the US followed by Canada (10%), UK (8%) and Australia (5%). The group also maintains a listing of veterinary clinics around the world that offer these procedures (170 clinics as of February 7, 2019).[22]

Clearly the awareness and interest in sterilization options beyond hysterectomy and orchiectomy has grown in recent years. However, the experience of the Parsemus Foundation indicates that there are not enough veterinary practitioners who offer alternative services to meet client demand. The American Veterinary Medicine Association estimates that there are > 68,000 companion animal veterinarians working in the US.[23] Yet only 195 veterinarians are listed as offering hysterectomy or vasectomy on the lists maintained by Parsemus Foundation or the Ovary Sparing Spay and Vasectomy Info Facebook group. The low proportion of practitioners offering hormone sparing alternatives was confirmed in a survey of 81 veterinarians at the 2017 AVMA conference. Whereas 73.4% reported discussing long-term health risks of traditional spay and neuter with dog owners prior to surgery, only 7.4% percent reported performing hysterectomies or vasectomies in dogs.[24] We are also not aware of any animal shelters offering the option of hormone-preserving sterilization, which may dissuade some individuals from adopting from shelters that require gonadectomy before release.

Looking forward and the need to address identification

Some may feel that the data available on negative sequelae from ovariohysterectomy and orchiectomy are not consistent or significant enough to warrant a change from the current practice. With any complex system, though, numerous individual and external factors influence outcomes. The recognition of this fact in human medicine has resulted in a move away from a model in which all patients receive the same care based on average responses to clinical trials, toward personalized (or precision) medicine, in which care is matched to an individual patient based on genetics, environment, lifestyle and other factors. Veterinary oncology is beginning to adopt this perspective.[25]

Sterilization method similarly requires an individualized approach, with the veterinarian and client evaluating risk factors specific to each dog. With the movement toward personalized medicine and increasing public demand, it is likely that over time, more veterinarians will begin to offer a variety of canine sterilization options, including hormone-preserving methods. Standardizing methods to identify dogs that have undergone sterilization is needed now. Apart from castration, which is usually visually identifiable, other methods (including nonsurgical sterilization) may not be obvious unless the dog is marked in some way. Appropriate identification of sterilized dogs is important so that the dog does not undergo surgery a second time unnecessarily.

Identification methods have been used in domestic animals for centuries and include various attributes: inherent features (visibility, duration and information conveyed) as well as practical features (ease and expense of administration and detection). The dog's situation (stray or owned) and aspects of the sterilization procedure (whether sedation is required) are also important components of choosing appropriate identification methods. For a coherent review of the pros and cons of dog marking procedures, see the Alliance for Contraception of Cats and Dogs.[26] For example, collars are highly visible, can convey different types of information, do not require sedation, are inexpensive, and are easy to apply, but they are not permanent and are not well-suited to stray dog populations since they must be monitored for replacement.

In evaluating the best identification option for hormone-preserving sterilization, the following considerations are relevant:

- Dogs receiving hormone preserving sterilization are usually owned
- Permanent identification is important, since identifying sterilization status becomes relevant when there is a lack of prior medical information (if dog is rehomed, lost or abandoned)
- Hormone preserving methods, including hysterectomy, vasectomy and intraepididymal chemical sterilization, require sedation or general anesthesia of the dog

The most common identification methods for owned dogs are collar, microchip or tattoo. Collars are not appropriate for identification in this situation; they are not considered permanent and even if a tag were created indicating the dog had been sterilized, the veterinary practitioner has little influence on whether the dog will retain the identification.

Microchips are becoming more common for dog identification. The microchip is inserted under the skin and a code can be read with a scanning device using radio frequency signaling. The code must be registered with a service linking it to the owner's information. Other information, such as sterilization status, can be maintained with the owner's data. Microchipping has been shown to assist with reuniting lost pets with their owners, but the inaccuracy of the owner's data can hamper the usefulness of microchips.[27,28] Additionally, there is added expense to implant a microchip, as well as the need to have a microchip reader and access to the microchip registry. While some countries now mandate microchip dog identification and ISO standards, the US has not adopted a standard radio frequency, making microchip reading more complicated.[29]

Microchips are gaining in popularity for pet identification, but tattoos have been commonly used to identify dogs since the mid 20th century in the US. A tattoo is visible, so there is no need for additional sensing equipment. Unlike collars and microchips, which rely on the dog owner's continued diligence for effectiveness, tattoos can be fully completed by the veterinarian at the time of sterilization.

Tattoos can be applied using several types of equipment: a tattoo clamp device which usually creates a number inside the ear; a tattoo pen which can be used to create freehand marks; or a needle filled with tattoo ink, which creates simple straight line marks (Figure 2).

Figure 2. Inguinal area of dog two years after tattoo using a needle to inject green tattoo ink to identify sterilization (arrow indicating tattoo). Photo credit: Ruth Steinberger, SpayFIRST.

The ink is inserted into the dermis layer of the skin and the mark is considered permanent, although the quality of the mark can degrade over time making it difficult to read. Microneedle tattoo patches, based on the microneedle vaccine delivery patch technology[30], is a new concept being studied that may provide a permanent mark without the need for equipment or sedation of the dog.[31]

Tattoos appear to be the most commonly used identifier for sterilized dogs, although a variety of marks are used. The ASPCA provides instruction for standardized marking of dogs that have been spayed or neutered, creating a single straight line of green ink.[32] However, there is a dearth of information available on what practitioners are adopting to identify dogs with nontraditional sterilization techniques.

To gain information on what identification, if any, veterinary practitioners use to mark dogs receiving hormone preserving sterilization, a survey was sent to 102 veterinarians who offer sterilization procedures beyond traditional spay and neuter. The brief survey asked if dogs receiving hysterectomy or vasectomy were marked, and if so, how. Twenty four responses were received. Results indicated that a majority of veterinarians do not provide any identification of dogs receiving a hysterectomy (85.7%) or a vasectomy (68.2%). Of the few who did mark dogs following hysterectomy, a microchip was used by 1 respondent, a green line on abdomen by another, and internal staple by the third respondent. To identify dogs receiving a vasectomy, 1 respondent used microchip and 6 used green tattoos (four used a green "V"-shaped tattoo and 2 used a green straight line tattoo).

Clearly, greater use of marking is required to prevent unnecessary repeat surgeries. However, lack of standardization has been a barrier to greater use. After review of common identification methods for owned dogs and methods being used currently by veterinarians, as well as consultation with theriogenologist Michelle Kutzler who has advocated for hormone-sparing dog sterilization, we recommend a simple tattoo in the inguinal area as the standard for hormone-preserving sterilization methods:

- Hysterectomy: Green "X" slightly lateral to midline near umbilicus
- Vasectomy: Green "V" lateral and cranial to scrotal region

The simplicity of the marks does not require dedicated tattoo equipment or special skill, so that most veterinarians could provide the identification. Tattoos can be created using a needle or scalpel to apply the tattoo ink to the dermis. The procedure is completed while the dog is sedated for a sterilization procedure, and no additional input from the owner is required and no additional equipment is needed for detection. Although clarity of a tattoo may decrease over time, in this case it is not necessary that it is legible, but just visible enough to inform a practitioner that a sterilization procedure had already been completed.

Conclusion

Gonadectomy became a standard of responsible veterinary care to address pet overpopulation issues in the late 20th century in the United States. Ovariohysterectomy and orchiectomy have been aggressively advocated for both owned and stray dog populations, with low cost/high volume spay/neuter clinics augmenting services provided by companion animal veterinary clinics, and animal shelters often mandating gonadectomy prior to release of adoptable dogs.

After decades of clinical experience with large numbers of gonadectomized dogs, researchers have begun to identify negative impacts on health and welfare after loss of natural hormones.[8,14] It has been only recently that potential negative outcomes of spay/neuter have gained the attention of the public, and our analysis indicates an increase in public interest in hormone-sparing sterilization methods. Hysterectomy, vasectomy and nonsurgical epididymal approaches are options to sterilize without impacting hormones, but are not widely practiced by veterinarians. Public demand is likely to grow, and the trend toward individualized, precision medicine will further influence the decision making process used by veterinarians and clients to determine the best sterilization method for a dog. Thus, hormone-sparing sterilization methods are expected to take a place as one of several available canine contraception options.

With the expected growth in the number of dogs receiving hormone-sparing sterilization surgery, it is important that identification is standardized so that dogs do not undergo unnecessary surgery if they are no longer with their original owners. Following analysis of markings currently in use, we recommend simple, green ink tattoos in the inguinal area, "X" for hysterectomy and "V" for vasectomy.

Conflict of Interest

The author claims no conflict of interest.

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