

Much information is beginning to emerge suggesting that routine spaying and neutering may have negative long-term health consequences for dogs and cats. This is a marked change from the time when many of us graduated from veterinary school: we were taught that spaying and neutering had population-control and health benefits, but almost no long-term downsides. This is a controversial area, and our knowledge of the pros and cons of routine spaying and neutering is certain to evolve over the next 10–20 years as more good data emerges. In the meantime, it is an area that many clients are likely to research on the internet, with mixed results. I will attempt to summarize the things we know, and the things we don't know, in this lecture.

Risks and Benefits of Spaying and Neutering

Prevention of Mammary Cancer

Other than population control, the most important reason to recommend spaying of female dogs is prevention of mammary cancer. In dogs, based on research conducted in California in the early 1960s, there is a correlation between the number of estrus cycles prior to spaying and the risk of mammary cancer:

<u>Time of ovariectomy (OVH)</u>	<u>Relative risk of mammary cancer (compared to intact dogs)</u>
Before 1 st estrus*	0.05%
Before 2 nd estrus	8%
Before 3 rd estrus	26%
After 3 rd estrus	100%

*As early as five months in cats and small breed dogs; six months in larger dogs

In cats, a recent study (Overly, *JVIM* 2006), it was demonstrated that a 91% reduction in mammary cancer risk in cats spayed prior to six months, and an 86% reduction in risk in cats spayed prior to one year. The above data suggest that the greatest benefit of spaying occurs if it is performed very early in life, so that ovarian hormones are not present during puberty, when the majority of mammary development occurs. Although recent publications have called the methodology of the 1960s research into question (Beuavais et al. 2012), the incidence of mammary cancer appears to be dramatically higher in European countries in which dog populations are predominantly sexually intact (Norway, Denmark, Italy). In these countries, mammary tumors account for 50–70% of all tumors; meanwhile, mammary cancer is relatively uncommon in the United States, where the majority of female dogs and cats are spayed. While the early studies need to be repeated, my personal bias is that the preponderance of the evidence suggests that an intact neuter status is a strong risk factor for mammary cancer.

Increased Risks of Other Cancers

Evidence has emerged that gonadectomy may predispose dogs to certain very common, very serious cancers. Some of this evidence is quite strong, some of it is less strong. Far less data is available for cats. The canine data is summarized in the following table:

<u>Type of cancer</u>	<u>Relative risk, castrated males</u>	<u>Relative risk, spayed females</u>
OSA	3.8	3.1
Prostate*	2.4–4.3	
Bladder TCC	2–4	2-4
Splenic HSA		2.2
MCT		4.11

*Prostate cancer is so rare that it really shouldn't be part of the conversation.

Effects of Gonadectomy on Non-cancerous Diseases

The effects of gonadectomy on various non-cancerous diseases are summarized below.

Castrated male dogs: Decreased risk—Perineal hernia, benign prostatic diseases, perianal adenoma, male-on-male aggression. Increased risk—Obesity, CCL rupture, diabetes, hip dysplasia.

Castrated male cats: Decreased risk—Roaming, fighting, peeing in the house, etc. Increased risk—Obesity, FLUTD, diabetes.

Spayed female dogs: Decreased risk—Pyometra. Increased risk—Obesity, urinary incontinence (5%), CCL rupture, hip dysplasia (?).

Spayed female cats: Decreased risk—Pyometra. Increased risk—Obesity, FLUTD (?), diabetes.

Key Open Questions

1. Does the information we have apply to all breeds of dogs and cats?
2. How do the incidences of the various diseases (cancerous and non-cancerous) compare to each other, with and without gonadectomy?
3. How should we weigh the facts that some diseases affected by gonadectomy are relatively rare, but fatal, and others are relatively common, but treatable?
4. What level of confidence should we have in the various studies?

Summary and Recommendations

Below are my recommendations to owners, based on my biases and my interpretations of the literature as it stands today. There are a few *caveats*: This is an extremely complex area, and there are far more questions than answers. New data that will replace current data will likely emerge over the next 20 years. I have a bias toward preventing diseases that are likely to be fatal over preventing treatable diseases, even though the treatable diseases in some instances may be more common. Spay-neuter decisions should be made *in conjunction with owners*, who need to be as fully informed as possible. Veterinarians do not have all the answers. For dogs and cats of both sexes, gonadectomy increases the risk of obesity, but obesity is preventable, so is only a minor consideration.

Male Cats

This is the easiest one. Neutering prevents behavioral issues, making neutered male cats better pets. Currently, there are no known major health downsides to neutering male cats.

Female Cats

Until data emerges that supplants our current data, I believe that female cats should be spayed prior to 5 months of age to prevent mammary cancer, which is almost uniformly fatal. Spaying will also eliminate the risk of pyometra. There are currently no known major health downsides to spaying cats.

Small- and Medium-sized Male Dogs (No osteosarcoma [OSA] Predilection)

The value of neutering is least clear for male dogs, and the issue should always be discussed with the owner. My current bias is that male dogs should not be neutered unless they have clear male-on-male behavioral issues that cannot be resolved in other ways. Remember that vasectomy is a birth control option. Neutering will decrease the risk of perineal hernia and non-cancerous prostatic diseases, but both of these are treatable. Neutering may increase the risk of bladder transitional cell carcinoma (TCC) and possibly other cancers as well as cranial cruciate ligament (CCL) rupture.

Large Breed Male Dogs (OSA Predilection)

Discuss neutering with the owner. My bias is that male dogs should not be neutered unless they have male-on-male aggression issues that cannot be addressed in other ways. If the owner wants neutering, recommend delaying it to beyond one year of age to decrease the OSA risk. Remember that vasectomy is a birth control option. Neutering will decrease the risk of perineal hernia and non-cancerous prostatic diseases, but these are treatable and the reduction in risk will likely still be present even if neutering is delayed well into young adult life. Neutering may increase the risk of OSA, other lymphoma, mast cell tumors (MCTs), splenic hemangiosarcoma (HSA), and possibly cancers; and CCL rupture.

Small- and Medium-sized Female Dogs (No OSA Predilection)

Neuter prior to five months of age to prevent mammary cancer (this will be my recommendation until someone demonstrates definitively that the sparing effect is less powerful than we currently think it is). Neutering will also

decrease the risk of pyometra. But it may increase the risk of bladder TCC and possibly other cancers, CCL rupture, and urinary incontinence.

Large Breed Female Dogs (OSA Predilection)

Neuter prior to six months of age to prevent mammary cancer (until someone definitively demonstrates that the sparing effect is less powerful than we currently think it is). Neutering will eliminate the risk of pyometra. But it may increase the risk of OSA, lymphoma, MCT, splenic HSA and possible other cancers; CCL rupture; and urinary incontinence.

Issues Related to Spay Technique

Laparoscopic Spay

The main advantage of the laparoscopic spay is that it is probably less painful than a traditional open spay during the first one to three days after surgery. However, the average dog tolerates a routine spay incision extremely well, so the gain in pain relief through laparoscopy is somewhat marginal. Laparoscopic spay requires a large equipment investment, and is more expensive for owners than open spay. However, it is actually easier to spay a large, fat dog laparoscopically than with open surgery. Many owners learn about laparoscopic surgery in animals via the internet, and develop a preference for it based largely on the perceived pain-sparing benefit; owner demand may continue to increase. Nevertheless, open spaying is a quick, reliable, proven, safe and effective procedure, and practitioners who do not offer laparoscopic spaying should not feel that they have “fallen behind.”

Ovariectomy (OVE) Versus Ovariohysterectomy (OVH)

For many years, European veterinarians have performed OVEs rather than OVHs. All of the advantages of spaying pertain equally with either technique. The main reason that OVH has been favored in the United States is that it has been thought to reduce the risk of stump pyometra. However, the most common cause of stump pyometra is leaving an ovarian remnant, not leaving a uterine remnant. Once the ovaries are completely removed, the uterus markedly atrophies and in the absence of ovarian hormones is very unlikely to become infected. A laparoscopic spay in the United States is most commonly an OVE. To perform an OVE with open surgery, the uterus can be single- or double-ligated about 1–2 cm from the ovary, and transected at that level.

Other Genital Surgical Procedures

Cesarean Section (C-section)

Dystocia often requires cesarean section. The most common cause of dystocia is primary uterine inertia, in which parturition either does not begin or is incomplete (only part of the litter is delivered). Dystocia can also result from secondary causes such as fetal malposition or large fetal size. The diagnosis of dystocia may be based on prolonged gestation, lack of progression from stage 1 to stage 2 labor within 12–24 hours, failure to deliver pups within 36 hours of the mother’s rectal temperature falling below 100 degrees Fahrenheit, and/or signs of sepsis.

If necessary, the surgical table can be elevated at the cranial end to reduce pressure on the diaphragm. A ventral mid-line abdominal approach is used and the uterus is exteriorized. An incision is made into the ventral or dorsal uterine body. Care is taken when incising not to lacerate a fetus. The fetuses are removed one at a time by milking them toward the incision and using gentle steady retraction to release the placenta at its attachment zone. If the placenta readily detaches from the uterus, the placenta and fetus are removed en bloc and transferred to an assistant, who then breaks the amniotic sac and ligates the umbilicus. If it does not readily separate, the amniotic sac is broken and the umbilicus is clamped off and transected by the surgeon and the fetus is handed over. After removal of all the fetuses, placentas are removed. If they are difficult to remove, they are left in the uterus. The uterus is flushed with saline and is closed in a simple continuous layer using absorbable material. Roles of the assistants in caring for the neonates include ligating the umbilicus; stimulating breathing and urination; and cleaning, drying, and warming the neonates. The neonates and the mother should be discharged within a few hours of the C-section.

Episioplasty

Episioplasty is performed to treat pyoderma or a urinary tract infection (UTI) resulting from excessive vulvar skin folds. This condition is seen in young female dogs with juvenile, recessed vulvas and in obese mature dogs. Signs may include pain, odor, vaginitis, UTI, urinary incontinence, and pollakiuria. Ideally, any pyoderma should be resolved medically prior to surgery. The amount of skin to be resected can most accurately be assessed with the patient in a perineal position. A crescent shaped circumferential skin incision is made around the base of the excess skin, dorsal and lateral to the vulva. Care must be taken not to remove too much skin, resulting in excessive

tension, or too little skin, resulting in a recurrence of clinical signs. The defect is closed routinely with subcutaneous and skin sutures. An Elizabethan collar (E-collar) should be placed postoperatively.

Scrotal Ablation

Scrotal ablation is performed for the treatment of scrotal trauma or dermatitis, or during urethrostomy in the intact obstructed male dog. It can also be performed for scrotal hematomas, particularly if infected, and it is occasionally performed during castration for older dogs with pendulous scrotums. The scrotum and testicles are elevated, and a circumferential incision is made around the base of the scrotum, taking care not to excise too much skin. If the dog is intact, the vaginal tunics are excised and an open castration is performed. The scrotum is removed and the subcutaneous tissues and skin are closed routinely.

Prostatic Omentalization

Omentalization is a valuable approach to the treatment of prostatic abscesses, liver abscesses, pancreatic abscesses, and stump pyometra. In all cases, the abscess is opened, the interior is debrided as thoroughly as possible, and omentum is used to fill the defect. The omentum is tacked to the edges of the abscess with absorbable sutures.

Reference

Beuavais W, et al. The effect of neutering on the risk of mammary tumours in dogs--a systematic review. *J Small Anim Pract*; 2012;53(6):314-322.