

# Optimal Timing for Spaying/Neutering Golden Retrievers

## Introduction

As the owner of Just Behaving, I've spent years observing Golden Retrievers and pondering a question that challenges conventional dog care wisdom: *When is the best time to spay or neuter, if at all?* For decades, the standard advice in the U.S. was to perform these surgeries around 6 months of age. This one-size-fits-all recommendation has been promoted so widely that questioning it can feel almost heretical. I remember the familiar refrain from TV host Bob Barker, “**Help control the pet population: have your pets spayed or neutered.**” That mantra, born of a genuine effort to curb pet overpopulation, has become ingrained in our culture. But in recent years, a growing body of research – and a growing chorus of veterinarians and dog owners – has started to ask whether routinely spaying/neutering puppies at a young age is truly in the best interest of each individual dog's long-term health and behavior.

This overview gathers current scientific findings and expert perspectives to inform a more nuanced approach, particularly for Golden Retrievers. Goldens are a beloved breed – gentle family companions, enthusiastic learners, and eager adventurers. They're also **one of the most studied breeds** when it comes to spay/neuter decisions, because they have known vulnerabilities to certain cancers and orthopedic issues. In these notes, I'll explore the history behind early-age spay/neuter practices and then delve into what modern science tells us about the health and behavioral outcomes of different approaches. Throughout, I'll maintain a thoughtful, questioning tone – much as I do when working through a training puzzle with a dog's owner. The goal is to balance the **holistic well-being** of our dogs (body, mind, and behavior) with the practical considerations of pet ownership and society's needs.

Importantly, I'm not pushing an agenda to never spay or neuter; rather, I'm advocating for informed, **individualized decisions**. We'll look at how sex hormones (estrogen and testosterone) influence a dog's development, what can happen when those hormones are removed early, and why some experts now recommend delaying or choosing alternative sterilization methods. We'll also focus on Golden Retrievers at each step, highlighting breed-specific findings. By the end, we should have a clear picture of why the blanket “spay/neuter by 6 months” rule is being re-examined, and how Golden Retriever owners in particular might think differently about the timing of these procedures.

## A Brief History of Early Spay/Neuter Practices in the U.S.

To understand how early spay/neuter became standard, we need to look at the **historical context**. The widespread promotion of spaying and neutering pets began in

earnest in the mid-20th century, mainly driven by the alarming growth of stray animal populations in urbanizing America.

- **Post-WWII Pet Boom and Overpopulation:** After World War II, pet ownership in the United States grew rapidly. No longer limited to rural farms, dogs and cats became common in suburban and urban households. Alongside this pet boom came a surge in unwanted litters and stray animals. By the 1960s and 70s, city and county shelters were overwhelmed. The **euthanasia rates** were heartbreaking – for example, the Humane Society estimated that around 13.5 million dogs and cats were euthanized in 1973. Shelters were underfunded, and the idea of healthy pets being routinely put to death due to lack of homes was a growing public concern.
- **Spay/Neuter as a Humane Solution:** In response, animal welfare organizations and veterinary leaders rallied around spay/neuter as a humane and logical solution. It was (and still is) seen as a proactive way to prevent unwanted litters, thereby reducing shelter intake and euthanasia. The first low-cost spay/neuter clinic in the U.S. opened in Los Angeles in 1969, and demand was huge – there was a four-month waiting list of people wanting their pets sterilized. By 1972, the ASPCA began **spaying/neutering all animals** adopted out from their shelters. Public awareness campaigns took off: in 1979, *The Price Is Right* game show host Bob Barker started signing off every episode with his famous plea to spay or neuter pets. This period also saw the establishment of “Spay Day” and other promotional events to encourage the practice.
- **Policy and Veterinary Support:** Government and veterinary institutions reinforced the movement. Many municipalities introduced higher licensing fees for intact pets to incentivize owners to sterilize their dogs. Veterinarians, embracing both a sense of social responsibility and the opportunity to prevent health issues like pyometra or mammary tumors, began routinely recommending spay/neuter to every pet owner. By the 1990s, the **recommended age** for spay/neuter had settled around 6 months – roughly before most female dogs’ first heat cycle – and this became the **norm for both sexes**. Shelters often adopted even earlier pediatric spay/neuter (at 8–12 weeks old) to ensure puppies and kittens were fixed prior to adoption, eliminating any chance of future breeding.
- **Primary Motivation – Population Control:** It’s important to note that the early push for spay/neuter was less about individual health optimization and **more about population control and public welfare**. The messaging to pet owners highlighted the prevention of unwanted puppies and kittens as a civic duty. Health and behavioral benefits were mentioned (“your female will never get uterine infections or cancers,” “your male won’t roam or mark as much”), but

these were often **ancillary selling points** added to persuade compliance. The core narrative was: sterilize your pet to be a responsible, humane member of society. And indeed, this campaign has had dramatic success in reducing shelter populations. By 2020, the number of dogs and cats euthanized in U.S. shelters annually dropped to around 347,000 – a tiny fraction of the crisis levels seen in the 1970s. Roughly **83% of pet dogs** in America are now spayed or neutered, an astounding cultural shift over a few decades.

- **Social Pressure and Assumptions:** With success came a strong social norm. Today, owners of intact pets are sometimes viewed as irresponsible unless they have a specific reason (like showing or breeding). I've had clients at Just Behaving feel pressured by other dog owners, or even some veterinarians, to neuter early – as if it's unquestionably the “right” thing to do. Dog daycares and parks often require dogs to be fixed past a certain age, further nudging people toward early surgery. For many years, questioning spay/neuter was almost taboo in the mainstream pet community. It was commonly believed that **not** spaying a female by 6 months or **not** neutering a male by maybe 1 year was just asking for trouble – from surprise litters to cancer to behavior problems.

Yet, through all of this, some voices hinted that the picture might be more complex. In Europe, for instance, routine spay/neuter is far less common. Many pet dogs remain intact their whole lives unless there's a specific medical need or management issue. European dog owners historically managed reproduction through confinement and leash laws rather than automatic neutering. Interestingly, **European dogs tend to live longer on average** than their American counterparts, as author Ted Kerasote observed during research for his book *Pukka's Promise*. He noted a “growing body of scientific evidence” that spaying/neutering could be linked to *shortened life span* and increased risks of certain cancers and orthopedic injuries. This doesn't prove cause and effect – lifestyle and breed differences play a role – but it raises a question: could our well-intentioned practice of early-age spay/neuter carry **unintended consequences** for long-term health?

By understanding the historical rationale (overpopulation control) behind the 6-month rule, we set the stage to ask: *If not for the population issue, would we still spay/neuter so early?* Or more provocatively, *Is what's good at a societal level always what's best for an individual dog?* These questions guide the rest of our deep dive, especially as we focus on Golden Retrievers – a breed for whom these decisions can be quite consequential.

## **The Physiological Role of Sex Hormones in Canine Development**

One key reason to question early spay/neuter is biology: **estrogen and testosterone are not just “reproduction hormones” – they play integral roles in a dog's growth**

**and development.** Removing a puppy's ovaries or testes means removing the primary sources of these hormones at a critical time. It's like pulling the hormonal rug out from under a growing body and brain. What happens then? Here's what science tells us:

## Hormones and Skeletal Growth

In dogs (as in humans), puberty is the body's signal to start wrapping up the growth phase. Estrogen and testosterone surge during adolescence and send a clear message to the bones: *"Time to close the growth plates."* Growth plates are the soft, developing areas at the ends of long bones. When they close, the bones stop growing in length. If this closure is delayed, the bones continue to grow longer than they otherwise would, which can upset the body's structural balance.

- **Growth Plate Closure:** Normally, a dog's growth plates close at a certain age depending on breed and size (for large breeds like Golden Retrievers, most plates close by around 12-18 months of age). Sex hormones are key to this timing. **If a dog is spayed or neutered before puberty**, the sudden lack of estrogen or testosterone **delays the closure of growth plates**. The bones, especially the long bones in the legs, may grow **longer than nature intended** because they didn't get the signal to stop on time.
- **Impact on Body Proportions:** Several studies have documented that dogs fixed early have **noticeably different skeletal proportions**. Dr. Christine Zink, a veterinarian and expert in canine sports medicine, notes that spayed females and neutered males tend to end up taller and lankier, with longer limbs relative to their body size. For example, the femur (thigh bone) or the radius and ulna in the forearm may grow a few millimeters more than they would have. This might sound minor, but those differences can **alter joint alignment**. I often describe it like building a house: even a slight measurement tweak in the foundation can put stress on the structure above. In dogs, that stress can manifest as **joint problems**. Research has linked early neutering to **higher rates of orthopedic issues** such as hip dysplasia, elbow dysplasia, and especially cranial cruciate ligament (CCL) tears in the knees. One veterinarian remarked he can often predict just by looking at a dog's build whether it was desexed early – early-neutered dogs can appear taller with narrower chests and heads compared to intact dogs of the same breed.
- **Golden Retrievers and Orthopedics:** Golden Retrievers are already prone to certain orthopedic troubles (hip dysplasia and CCL injuries are not uncommon in the breed). The hormonal effect on their growing bones can exacerbate these issues. A landmark 2013 study at UC Davis examined **759 Golden Retrievers** (a mix of intact and neutered dogs) and found striking differences in joint disorder incidence based on spay/neuter timing. In that study, **0%** of intact Goldens had

torn cruciate ligaments, versus **5% of males and 8% of females neutered before 1 year** who did suffer CCL tears. Hip dysplasia was diagnosed in about **10% of early-neutered males**, double the rate of intact males. In other words, early neutering *fivefolded* the risk of a Golden Retriever developing a joint problem like a knee ligament tear. These are significant numbers that hit home for owners who want their Goldens to lead active, pain-free lives. A torn cruciate often means expensive surgery and months of rehab, not to mention arthritis down the line.

- **Muscle Strength and Support:** Beyond bone length, hormones also influence **muscle development and ligament strength**. Testosterone, for instance, helps build muscle mass. A dog neutered very young might have a harder time gaining the robust muscle that would normally support their joints. Estrogen has a role in maintaining ligament integrity as well. Without these hormones, some experts believe the joints are more lax or unstable, making injuries like ACL tears more likely. This is consistent with clinical findings that spayed/neutered dogs have higher odds of orthopedic injuries. I've noticed in training that some neutered male Goldens have a more "gangly" adolescent phase and take longer to fill out physically, which could be related to this muscle development aspect.

In summary, sex hormones act as the **body's finishing carpenters**, directing final growth and strengthening. Taking them away early is like leaving a job site with the work unfinished – the framework might extend a bit haphazardly and not gain the intended reinforcement. For Golden Retrievers, this often means a taller stature but potentially weaker support in the hips and knees, which is a poor trade-off for an athletic, medium-large breed.

### **Hormones and Organ Health (Beyond Reproduction)**

Estrogen and testosterone have far-reaching effects on various organ systems. They are involved in regulating metabolism, immune function, and even the health of skin and coat. When we remove the gonads, the levels of these hormones plummet, and **other hormones can surge in response** (for example, luteinizing hormone, LH, shoots up because the body is trying to stimulate gonads that are no longer there). This hormonal ripple effect can influence health in subtle and not-so-subtle ways.

- **Metabolism and Growth:** Many dog owners observe that their spayed/neutered pets gain weight more easily. It's not just because of increased appetite after surgery; hormonally, the metabolism shifts. Both estrogen and testosterone help regulate how calories are used – they promote lean muscle and energy expenditure. Without them, dogs may become **less energy-efficient and more prone to fat storage**, which is one reason obesity risk can double after spay/neuter. In Goldens, who *love* their food and treats, keeping an intact

metabolism a bit longer might help manage weight during that juvenile stage when they're already little eating machines.

- **Bone Marrow and Immune System:** There's some evidence that sex hormones interact with the immune system. For example, estrogen has been noted to have protective effects against certain immune-mediated diseases. Removing hormonal influence might change a dog's susceptibility to illnesses or how they respond to vaccines. A retrospective study showed up to a **27–38% increase in adverse vaccine reactions** in spayed/neutered dogs compared to intact dogs. This could be due to hormonal effects on the immune system's regulation. While not breed-specific, it flags a potential area where "one less thing" (the hormones) might lead to *other* things cropping up.
- **Urinary Continence:** A well-known issue, especially in spayed females, is **urinary incontinence**. Some spayed bitches (often larger breeds) will leak urine when relaxed or sleeping. This is because estrogen helps maintain muscle tone in the urethral sphincter; without enough estrogen, that sphincter can weaken. Studies estimate about **4% to 20% of spayed female dogs** end up with hormone-responsive incontinence, and it's more likely the earlier the spay is done. I've encountered a few heartbroken owners who spayed their Golden girls at 6 months thinking it was healthiest, only to have a incontinent dog by age 3 or 4, requiring lifelong medication and management (not to mention lots of laundry). Keeping a female intact through puberty allows her body to fully develop urinary control mechanisms. If spayed later, the risk of incontinence drops – some vets now recommend waiting until after the first or even second heat for this reason alone.
- **Thyroid and Endocrine Balance:** Removal of sex hormones can impact other hormonal axes. Neutered dogs show higher risk of **hypothyroidism** (underactive thyroid). The thyroid gland controls metabolism and a host of bodily functions, and hypothyroid dogs can become lethargic, overweight, and prone to skin issues. It's been noted that spay/neuter **triples the risk of hypothyroidism** in dogs. Golden Retrievers, unfortunately, are already predisposed to hypothyroidism as a breed. Eliminating sex hormones early might further tip some Goldens toward developing this condition, which then requires daily medication to manage.
- **Longevity and "Protective" Effects:** Perhaps one of the most eye-opening findings in recent years is the link between keeping ovaries and **longer lifespan** in females. A 2009 Purdue University study of 305 Rottweilers famously found that females who kept their ovaries until at least 6 years old were **4.6 times more likely to reach age 13** (exceptional old age for Rotties) compared to those

spayed earlier. The ovaries, it seems, secrete something beneficial beyond just fertility – possibly hormones or other factors that protect against aging and disease. While that study was in Rottweilers (a breed with some similarities to Goldens in size and cancer risk), it suggests that allowing a female dog to experience several years of natural hormonal cycles could contribute to better long-term health and longevity. It raises the provocative idea that in spaying young, we might inadvertently be shortening the very lives we seek to improve. Goldens have a roughly 10-12 year average lifespan; perhaps a later spay could edge that upward by guarding against some fatal diseases (more on those in the next section).

In sum, sex hormones act as **multi-purpose regulators** in a young dog's body. They guide proper closure of growth plates, influence muscle and metabolic development, and help maintain organ health (from the brain to the bladder). Golden Retrievers, being a large breed, benefit from the timing of these hormones to grow proportionately and develop strong support systems. Removing the ovaries or testes too soon not only alters their body structure but can leave them vulnerable to certain health problems that might otherwise have been mitigated by a natural maturation process. This understanding sets the stage to explore the specific health risks that studies have associated with early spay/neuter – particularly in Goldens – and why some of those risks have given pause to veterinarians and owners alike.

### **Long-Term Health Outcomes: Early Spay/Neuter Risks vs. Benefits**

When deciding whether or when to spay or neuter a Golden Retriever, health outcomes are a major consideration. It's not just about preventing puppies; it's about **the dog's future risk for diseases**. Early spay/neuter does eliminate some health risks entirely (like pyometra in females, or testicular cancer in males), but at the same time, researchers have found that it **increases the risk of other serious conditions**. Let's break down the major long-term health factors at play:

#### **Cancer Risks**

Golden Retrievers, sadly, are notorious for cancer. A high proportion of Goldens will face cancer in their lifetime, spayed/neutered or not. The big ones in this breed include **hemangiosarcoma** (a cancer of blood vessel cells, often in the spleen or heart), **lymphoma/lymphosarcoma** (cancer of lymph nodes/immune cells), **mast cell tumors** (a type of skin cancer that can be benign or aggressive), and **osteosarcoma** (bone cancer, more common in large breeds). So how does spay/neuter timing affect these risks?

- **Lymphoma (Lymphosarcoma):** The UC Davis Golden Retriever study found that almost **10% of early-neutered males** (neutered before 1 year) developed

lymphoma, **three times the rate** seen in intact males. Neutered male Golden Retrievers in that sample clearly had a higher incidence of this cancer. Interestingly, neutered females did not show a spike in lymphoma in that particular study – it seemed a male-specific vulnerability. It suggests that testosterone (or its absence) might influence immune-related cancer development in males. Another study echoed this: neutered male Golden Retrievers had a higher risk of lymphoma, but females were less affected by neuter status for this cancer. For a breed where any advantage counts, keeping a male intact for longer might reduce lymphoma likelihood.

- **Hemangiosarcoma (HSA):** This is a particularly deadly cancer (often causing sudden internal bleeding). In the Golden study, **late-spayed females** (spayed at or after 12 months) had the highest HSA rates – about 8% of late-spayed females got hemangiosarcoma, which was **four times** more than intact females. Early spaying also likely increases HSA risk; other research (on breeds like Vizslas and in Dr. Zink's analysis) indicates that removing ovaries **doubles the risk of splenic hemangiosarcoma and quintuples the risk of cardiac hemangiosarcoma** in female dogs. It appears estrogen may have a protective effect against these cancers, and losing that protection, even later in youth, is detrimental. Golden Retriever females are especially prone to hemangio, so this is a significant concern. For male Golden Retrievers, the data is less clear but neutering does remove testosterone which might also have some protective roles; one study on another breed (Vizsla) found increased hemangio in neutered males too. The overall trend suggests **intact dogs of both sexes have lower hemangiosarcoma rates** than their spayed/neutered counterparts.
- **Mast Cell Tumors (MCT):** These skin tumors range from mild to aggressive. In the UC Davis study, **intact female Golden Retrievers had 0% incidence of MCT**, whereas late-spayed females had nearly 6% incidence. That's a notable jump. Early-spayed females in that study didn't show MCT either, interestingly – it was the late-spayed group that stood out, though "late" in this context was just after 1 year. This might indicate that even one or two heat cycles before spay didn't fully shield them from the risk; or it could be a statistical quirk of that dataset. However, another large study of over 2,500 Vizslas found **significantly higher rates of mast cell cancer in dogs spayed or neutered at any age** compared to intact. Golden Retrievers and Vizslas are different breeds, but both are cancer-prone, suggesting that gonadal hormones (or their removal) indeed influence cancer biology.
- **Osteosarcoma (Bone Cancer):** Large breeds are at risk for osteosarcoma, and some data (compiled by Laura Sanborn in a comprehensive 2007 review of spay/neuter literature) indicates that spaying/neutering **increases osteosarcoma risk by 2-3 times**. Rottweilers (another large breed) had a



known correlation: one study found that **Rotties spayed/neutered before a year of age had much higher osteosarcoma rates** than those left intact longer. For Goldens, osteosarcoma is not as common as in Rottweilers or greyhounds, but it does occur. The implication is that letting a dog reach full skeletal maturity with their hormones might reduce bone cancer risk – possibly because the hormones influence bone turnover or growth in ways that make cancerous changes less likely.

- **Other Cancers:** There are other cancers influenced by spay/neuter status as well. **Bladder cancer** (transitional cell carcinoma) is relatively rare, but neutered dogs have a higher incidence – in fact spay/neuter is associated with a 3-4 times greater probability of both benign and malignant bladder tumors. **Prostate cancer** in males, ironically, is more common in neutered males than intact (intact males get more benign prostate enlargement, but the malignant cancer is actually **four times more likely in neutered males**). Goldens are not especially prone to bladder or prostate cancer, but it's part of the big picture: sterilization isn't a free health boost; it shifts the risk profile to other areas.

On balance, what does this mean for Golden Retrievers? If neutered very young, a Golden is statistically more likely to face certain cancers (like lymphoma in males, and likely hemangio or mast cell tumors for both sexes) as they age. Keeping them intact longer **may lower those specific cancer risks**, though it's not a guarantee that an intact dog won't get cancer (Goldens can unfortunately develop these cancers even when intact, due to genetic and environmental factors). It's a game of probabilities. The key takeaway is that the traditional promise – “spay/neuter to prevent cancer” – is **only half-true**. Yes, early spaying of females almost eliminates the risk of mammary cancer (if done before the first or second heat, the risk of breast tumors drops dramatically, which was one original health reason for the 6-month guideline). Mammary tumors can be a big issue in intact older females (about 1 in 4 intact female dogs over age 8 will get mammary tumors, many being benign but some malignant). So that's a benefit of spaying – it's worth acknowledging. However, the emerging science shows that for Golden Retrievers especially, the **increase in other cancers** after spay/neuter might outweigh that benefit. For instance, mammary cancer in Goldens is not nearly as common as hemangiosarcoma or lymphoma. Trading a smaller risk (mammary tumors) for a larger one (hemangio or lymphoma) is a dubious bargain.

In fact, Laura Sanborn's review concluded: *“On balance, it appears that no compelling case can be made for neutering most male dogs, especially immature males, in order to prevent future health problems... For female dogs the situation is more complex. The number of health benefits associated with spaying may exceed the associated health problems in some (not all) cases. On balance, whether spaying improves the odds of overall good health or degrades them probably depends on the age... and the relative*

*risk of various diseases in different breeds.*”. In plainer terms: for males, the cancers you prevent by neutering (e.g., testicular cancer) are so low-risk or easily treatable that it doesn’t make much sense health-wise to neuter solely for that reason – and you might be causing more harm than good. For females, it’s a tougher call because of mammary cancer and pyometra prevention (which we’ll discuss shortly), but the **breed matters**. In a Golden Retriever, which isn’t especially prone to mammary tumors but is prone to other cancers, delaying spay or leaving the dog intact might actually improve her overall odds of a long healthy life.

- **A Note on Pyometra and Reproductive Cancers:** Spaying a female removes the risk of pyometra, a life-threatening uterine infection that affects around 1 in 4 intact older females. It also eliminates the (small) risk of ovarian or uterine cancers, and significantly reduces the risk of benign mammary tumors if done early. These are the **pro-spay health points** that are absolutely valid. For each individual owner, these risks have to be weighed against the increased risks of other conditions we’ve been enumerating. Pyometra can generally be prevented by spaying *at some point* – it doesn’t have to be at 6 months; a dog spayed at 4 or 5 years old, after a few litters or heats, is no longer at risk of pyometra either. Likewise, mammary cancer risk, while lowest if spayed before first heat, is still significantly reduced if spayed before the second or third heat (before ~2.5 years old). So one strategy some owners take is to allow the dog to go through 1-2 heat cycles for the developmental benefits, then spay to mitigate mammary tumor risk. This approach tries to capture the best of both worlds, though it may not fully eliminate the orthopedic and some cancer risks if done at, say, 18 months rather than 6 – timing matters and research is ongoing to pinpoint the sweet spot for each breed.

## Orthopedic and Joint Disorders

We touched on this in Section 2, but let’s detail it under health outcomes because for many large dog owners, **joint health is a huge concern** (nobody wants their dog to limp with arthritis at age 5 or undergo major knee surgery at 2). Early spay/neuter’s impact on orthopedics has been one of the most clearly demonstrated issues in studies:

- **Hip Dysplasia:** Golden Retrievers are a breed with a moderate incidence of hip dysplasia (a malformation of the hip joint that can cause arthritis and lameness). In the UC Davis data, early-neutered male Golden Retrievers had double the rate of hip dysplasia compared to intact. Dr. Zink notes a **50% increase in hip dysplasia risk in spayed/neutered dogs** versus intact. The theory is that the extra growth caused by delayed plate closure leads to slight joint incongruities – the hip socket and femur head may not fit as snugly, increasing laxity and dysplasia chances. For a

Golden who might be genetically borderline for dysplasia, staying intact through growth could be the difference between developing clinical dysplasia or not.

- **Cranial Cruciate Ligament (CCL) Tears:** This is the dog analog of ACL tears in humans. It's one of the most common orthopedic injuries in all dogs, and especially in active, medium-large dogs like Golden Retrievers. Studies consistently show **higher CCL tear rates in early-neutered dogs**. The Golden study from UC Davis had that dramatic finding: 0% incidence in intact, but several cases in early-neutered groups. Another study of Labrador and Golden Retrievers combined also found a higher prevalence of CCL injuries in neutered dogs. Dr. Zink's summary cites a **significantly increased incidence of CCL rupture in spayed/neutered dogs** overall. If you've ever had a Golden with a "blown knee," you know it's tough – typically it requires surgery (TPLO or similar), months of restricted activity, and often the other knee goes bad later due to the increased weight-bearing. This is not something any dog owner wants to go through if it can be helped. Thus, if keeping a Golden male intact until 18-24 months could substantially lower his risk of a cruciate tear, that's a compelling argument to wait on neutering.
- **Elbow Dysplasia:** Less talked about, but some large breeds get elbow dysplasia (a developmental issue in the elbow joint). The UC Davis research didn't show a strong difference in elbow dysplasia for Golden Retrievers based on neuter status (the incidence was low in all groups). However, across breeds, neutering appears to have minimal effect on elbow dysplasia compared to hips and knees. That said, any growth irregularity could potentially affect complex joints like the elbow, so it's still under watch.
- **Other Orthopedic Concerns:** Early neuter has also been linked to **increased risk of patellar luxation** (kneecap slipping, particularly in smaller breeds, but Zink noted a 2.1x higher risk in sterilized dogs). While patellar luxation isn't common in Golden Retrievers, it demonstrates that across the skeletal system, hormone loss can influence joint stability. Spayed/neutered dogs also often have a somewhat **narrower pelvis and chest** (due to those growth changes), which can affect their gait and possibly predispose them to injuries during high-impact activities. It's notable that many sports medicine veterinarians – the ones who work with agility and working dogs – have become outspoken about delaying spay/neuter. They observed that their canine athletes kept intact had fewer sports injuries than those altered early, which aligns with the data we've discussed. Golden Retrievers love to run, fetch, swim, and play; maintaining their structural integrity through their developmental period can set them up for a more active, sound adulthood.

## Other Health Considerations

Beyond cancer and orthopedics, a few additional long-term health issues are influenced by spay/neuter status:

- **Obesity:** We mentioned weight gain as a metabolic effect. Studies show neutered dogs are more prone to obesity (about 1.6 to 2 times more likely, depending on diet management). Obesity itself shortens a dog's lifespan and predisposes them to diabetes, orthopedic strain, and other problems. So indirectly, if early neuter leads to easier weight gain and the owner doesn't adjust feeding sufficiently, that dog could develop weight-related issues. Of course, weight can be managed with proper diet and exercise, but it's something to be aware of, especially in food-motivated Golden Retrievers.
- **Urinary Health:** The estrogen-related incontinence in spayed females was covered earlier. Additionally, the risk of **urinary tract infections (UTIs)** is higher in spayed females, likely because of slight anatomical changes post-spay (the vulva may remain more recessed if spayed before full maturity, leading to hygiene issues). One review found spay increases UTI risk by more than 3x. Also, as mentioned, spay/neuter roughly doubles the risk of **bladder tumors** (though these are rare).
- **Hormone-Related Disorders:** Some studies have posited links between early gonad removal and **dog dementia (cognitive dysfunction)** in old age, possibly due to disrupted hormone signaling in the brain. There's ongoing research about whether lifetime exposure to luteinizing hormone (which is excessively high in desexed pets) contributes to cognitive decline or even certain cancers. While not conclusive, it's another angle being explored.
- **Vaccination and Immune Response:** The increased vaccine reaction rate (up to 38% higher) in neutered dogs suggests that hormone status might affect immune tolerance or reactivity. It's a reminder that removing part of the endocrine system has body-wide effects.

To balance the picture, let's list the **major health benefits** that traditional spay/neuter does provide, because it's not all negative:

- **Prevents pyometra:** As noted, intact females have about a 23% chance of developing pyometra by old age, and it can be fatal in 1% of cases if not treated in time. Spaying, of course, prevents this completely (and a partial spay like just removing the ovaries does too, since no heats = no pyo). This is a serious consideration for females kept intact into their senior years.

- **Greatly reduces mammary cancer risk:** If a female is spayed before her first heat, her risk of mammary tumors is tiny (often quoted as <1%). Before the second heat, it's still low (maybe ~8%). After two or three heats, that protective effect diminishes and an intact female may have up to a 1 in 4 chance of mammary tumors in later life. While many mammary tumors in dogs are benign, a significant number are malignant. So if a Golden Retriever bitch is from lines with mammary tumors or if an owner is very risk-averse to that, they might opt not to leave her intact indefinitely. A compromise might be to allow one heat (to get some hormonal benefits) then spay before she's 2 years old, thus still cutting down mammary tumor risk considerably.
- **Eliminates risk of testicular cancer:** Neutering a male obviously means no testicular tumors ever. However, testicular cancer in dogs is generally uncommon and often very treatable by simply neutering at the time of discovery. So as health benefits go, this is more of a minor one. In exchange, neutered males see higher risk of other cancers as we discussed, so this benefit is often outweighed by those risks for most dogs.
- **Prevents benign prostatic hyperplasia (BPH) and perianal tumors in males:** Intact older male dogs often get an enlarged prostate as they age, which can cause discomfort or difficulty urinating/defecating. Neutering shrinks the prostate and prevents this. It also prevents perianal adenomas (tumors near the anus that are testosterone-driven). These conditions are typically issues in senior dogs, and they're real considerations. For a male Golden who is, say, 8-10 years old and still intact, a vet might recommend neutering at that point if BPH is detected. But BPH is rarely life-threatening, and neutering later in life can resolve it, so it doesn't necessarily argue for **early** neuter.
- **Stops unwanted litters:** This is obvious but in health terms it means no pregnancy complications (like difficult labor or infections post-birth) and no risk of cancers related to the reproductive tract if those organs are gone. Avoiding pregnancy is indeed important for a pet not intended for breeding; but again, it doesn't have to be accomplished via early-age gonad removal – careful management or alternative sterilization (which we will discuss) can also do the job.

The bottom line on health: **It's a trade-off.** Early spay/neuter trades off certain **reproductive organ-related risks** (pyometra, mammary tumors, testicular cancer) for increased **musculoskeletal and other cancer risks**. For Golden Retrievers, whose leading causes of death include cancer (often hemangio or lymphoma) and where orthopedic issues can severely impact quality of life, the trade-off often does not favor early neuter. The calculus might be different for, say, a toy poodle (where mammary

tumors might be a bigger concern and orthopedic issues minimal). That's why researchers like the UC Davis team emphasize that there is **no one-size-fits-all answer** – it varies by breed, sex, and even individual family circumstances.

For our Golden Retrievers, the evidence tilts toward **caution with early spay/neuter**. Many vets now advise Golden owners to **wait until at least 18 months, if not 2 years, before spaying or neutering**, to allow the dog to mature fully. Some breeders of Golden Retrievers, in fact, write into their puppy contracts that the dog should not be altered before a certain age (often 18-24 months) because they want to protect the puppy's developing joints and reduce cancer risk. This is a significant shift from the old "fix them at 6 months" rule. It's a shift rooted in the science we've just reviewed.

### **Benefits of Delaying Sterilization or Keeping a Dog Intact (for a While)**

By now, the benefits of *not* spaying or neutering too early have become evident through the risks we outlined. Let's flip the perspective and enumerate the **positive outcomes of delayed sterilization or remaining intact**, especially when combined with responsible pet ownership:

- **Complete and Natural Development:** A dog that remains intact through puberty and young adulthood gets the full benefits of their hormones for growth. This means **stronger bone density, proper joint formation, and fuller muscle development**. For a Golden Retriever, waiting to neuter until after 1-2 years can result in a sturdier, more physically resilient dog. I often see intact male Golden Retrievers that have a more filled-out musculature and broader head – the classic "blocky head" Golden look is actually testosterone-influenced. Intact females allowed to go through a few heat cycles often have more developed musculature as well and may be less prone to the "spay sprawl" (a term some owners use for the way spayed females can appear looser in the hind end). In short, delaying means the dog's body **matures as nature intended**, which can pay dividends in athletic ability and perhaps reduce injury risk.
- **Potentially Reduced Long-Term Ailments:** As we saw, intact dogs (or those spayed/neutered later) have lower rates of many cancers and orthopedic injuries. Therefore, a benefit of keeping your Golden intact for longer is simply **reducing the likelihood** they will face those problems. No one can guarantee an individual dog won't get, say, hemangiosarcoma – but you're not amplifying the risk by removing hormones early. Additionally, intact dogs avoid issues like spay incontinence or endocrine disorders that come with early desexing. I've had several clients with neutered male Golden Retrievers who developed hypothyroidism or obese tendencies relatively young; while intact Golden Retrievers can certainly get hypothyroid too (it's common in the breed), the risk may be lower if we don't disrupt their endocrine system too soon.

- **Behavioral Stability (with training):** I'll dive deeper into behavior in the next section, but it's worth noting here: intact dogs that are well-trained and managed can be just as behaved as neutered ones, and in some cases **even more stable emotionally**. There is a growing viewpoint among trainers and behaviorists that letting dogs reach social maturity with their hormones can result in **more confident, less fearful** dogs. Anecdotally, I've seen this with Golden Retrievers: intact Goldens (especially males) that mature fully tend to have that classic confident, goofy, loving Golden temperament. Some early-neutered Goldens, by contrast, seem to retain a more juvenile, skittish or overly excitable demeanor for a longer time. We'll explore whether that's hormones or just individual differences soon, but if hormones do contribute to behavioral maturity (as some studies suggest), that's a benefit to keeping them intact longer.
- **Longevity:** While research is ongoing, there are hints that **keeping a dog intact for several years might extend lifespan**. The Rottweiler study was a dramatic example (intact females living much longer). There's also demographic data from parts of Europe (where many dogs are intact) indicating dogs often live slightly longer there, though many factors confound that. For Golden Retrievers, this hasn't been conclusively proven, but given that the major killer (cancer) seems to strike earlier and more frequently in desexed Goldens, it stands to reason that a well-managed intact Golden could statistically live longer. A Swedish study of several breeds found that spayed/neutered dogs did not live longer than intact ones when controlling for cause of death – in fact, intact dogs had just as good if not better survival in some age brackets, except where death was due to infectious disease or trauma (intact dogs had a bit more of those, likely because intact males roam and get hit by cars more often, for example). So if you can manage the safety of an intact dog (prevent roaming, etc.), you might **remove that survival disadvantage** and only gain the health advantages.
- **Preservation of Natural Hormonal Balance:** There's an intrinsic value, often appreciated in holistic pet care circles, to preserving an animal's natural state as much as possible. Hormones cycle through a dog's body and contribute to a balance that we're only beginning to understand fully. Some owners report that their dogs just "feel different" after spay/neuter – lower energy, changes in coat quality (spayed dogs can get a fuzzier coat due to lack of estrogen's influence on hair follicles, for instance). By keeping a dog intact, you keep that hormonal harmony. If issues arise (like a female having very intense heat cycles or false pregnancies, or a male getting too pushy or marking), those can often be managed through training or, if needed, you still have the option to neuter later. But once you remove the hormones, you can't go back (aside from rare cases of hormone replacement therapy, which is not common in dogs).

- **Opportunity for Alternatives:** Remaining intact also leaves open the door for **alternative sterilization methods** (discussed in Section 6). If you neuter in the conventional way (remove the gonads), you can't later decide you wanted an ovary-sparing spay or a vasectomy – it's too late. But if you wait and research, you might find a veterinarian who can do a hormone-sparing sterilization down the road. This way, you eventually prevent reproduction but keep those beneficial hormones. So delaying buys you time to consider all options and make a deliberate choice rather than following a knee-jerk timeline.
- **Responsible Breeding Plans:** In some cases, owners delay spay/neuter because they are considering breeding their dog (responsibly, with health checks, etc.). While not the focus of this article, it's worth noting that keeping a dog intact for potential breeding (especially to contribute to the preservation of a breed like Golden Retrievers with a limited gene pool) can be beneficial for the breed's health in a broader sense. Even if only a small fraction of dogs will be bred, not automatically neutering every pet-quality dog at 6 months means breeders have a larger pool to select from when looking for healthy traits. I mention this because part of holistic well-being is also genetic health – if we neuter every dog early, we might inadvertently be removing healthy genes from the population. Some Golden Retriever breeders and clubs encourage puppy buyers to hold off on spay/neuter and perhaps allow a dog to be used in a carefully planned breeding if it turns out exceptionally healthy or has qualities worth passing on. This is a side benefit of not rushing into neutering: you keep future possibilities open.

All these benefits hinge on **responsible ownership**. An intact dog is not necessarily harder to own, but it does require vigilance: preventing unwanted matings, dealing with a female's heat cycle mess and mood, making sure an intact male doesn't become a nuisance or wanderer. I always emphasize to clients: delaying spay/neuter is not a license to be careless; it's a commitment to managing your dog diligently. If you're going to keep your Golden girl intact until age 2, you must be prepared for her to go into heat perhaps twice, which means keeping her away from all males for about 3-4 weeks each time and handling some bleeding. If you keep your Golden boy intact, you'll need good fencing and leash habits to ensure he doesn't catch a whiff of a neighborhood female in heat and take off. It also means training him from a young age that marking and mounting are not acceptable behaviors in the house or with people, because he will have the urge, more so than a neutered dog.

The good news is, **responsible ownership is very achievable**, and many countries have intact pet populations with minimal issues by adhering to strict leash laws and owner education. It really comes down to knowledge and commitment. In exchange, you are potentially giving your Golden Retriever the gift of better physical development



and a healthier life. In the next section, we'll look specifically at behavior – because even if health benefits are clear, some worry that an intact dog will be more aggressive or harder to train. Is that true or just another assumption worth questioning?

## Behavioral Development and Hormonal Influence

Behavior is often the elephant in the room in spay/neuter discussions. Traditionally, pet owners have been told that neutering will “calm a dog down” or reduce aggression, and that an intact dog will be driven by hormones to roam, hump, and misbehave. There is **some truth and some myth** in these statements. As a trainer, I (Dan) place huge importance on training and environment in shaping a dog's behavior, far more than their reproductive status. Let's examine what recent research and real-world experience say about behavioral effects related to spay/neuter, especially for Golden Retrievers:

- **Basic Temperament vs. Hormonal Behaviors:** First, it's important to differentiate between a dog's core temperament (confidence, anxiety level, sociability, etc.) and **sex-related behaviors** (marking, mounting, roaming, inter-dog aggression in some cases). Neutering a male will almost certainly reduce urine marking and roaming drive, and it will remove mating behaviors – that is well-documented. It might reduce certain types of aggression that are tied to sexual competition (e.g., two intact males fighting over a female). Spaying a female eliminates the mood changes and attractiveness that come with heat cycles (some females get a bit agitated or anxious during heat, though many are just fine). These are real effects: for instance, about 70% of male dogs show reduced mounting behavior after neuter, and intact males are responsible for the majority of roaming incidents. However, these behaviors can also be managed: marking can be managed with training and limiting access, roaming prevented with secure containment, and so on.

What neutering/spaying **does not do** is magically turn an unruly dog into a well-behaved one. Training is key. In fact, if a dog's unwanted behaviors are not related to sex hormones (for example, a Golden who is hyperactive, mouthy, or has separation anxiety), neutering won't fix those at all. Sometimes owners have neutered a dog hoping to calm him down, only to find the dog is just as energetic and now they've also affected his growth/hormones for no behavioral gain.

Golden Retrievers in general are not a particularly aggression-prone breed (they're known for gentleness), so the main behavioral reason people neuter Golden Retrievers is usually to curb urine marking or prevent mating, rather than out of fear of aggression.

- **Aggression and Fear:** Contrary to older assumptions, **neutering does not reliably reduce aggression** in all cases – and in some cases can *increase* certain types of aggression or fear-based behaviors. A comprehensive behavioral study in 2023/2024 found that **neutered dogs were more likely to show**

**aggression and fearfulness than intact dogs** when looking at a broad range of behaviors. The neutered dogs in that study were also less calm and less trainable on average. This is a startling finding: it suggests that hormones like testosterone might actually contribute to a dog's confidence and sociability. When you remove them, some dogs become more anxious or reactive. It's worth noting this was a survey-based study on mixed breeds, but it aligns with other research and anecdotes. Another dataset showed early-age spay/neuter was linked to **increased noise phobias** (like fear of thunderstorms). I have indeed encountered a number of neutered Golden Retrievers who are unusually fearful – whether of loud noises, new environments, or other dogs – and I can't help but wonder if lack of hormones during development played a role in those cases. Golden Retrievers typically should be confident and outgoing by nature. The relationship between hormones and behavior is complex. Testosterone is often demonized as causing aggression, but it can also promote boldness. Estrogen can influence mood in females (some intact females might show irritability during heat, but it's temporary and some show no change at all). Importantly, aggression in dogs is usually multi-factorial: genetics, socialization, training, and environment all contribute. Spay/neuter is just one factor. For Golden Retrievers, who as a breed are more likely to show *friendly exuberance* or *enthusiastic gregariousness* than true aggression, neutering isn't needed to "tame" them. If a Golden is showing aggression, there's likely another underlying issue beyond just being intact.

- **Behavioral Maturation:** One aspect often overlooked is that intact dogs go through a natural **behavioral maturation** in their second year of life. Intact males, for instance, may start out puppy-like and then around 1-2 years become a bit more reserved or territorially aware as they mature – this is normal social maturation. Intact females may mature into a more adult demeanor after a couple of heat cycles. Some trainers and behaviorists (myself included) believe that **early neutering can arrest or alter this maturation process**, leaving dogs with a more perpetual puppy-like mindset or causing odd developmental gaps. For example, anecdotally, an early-neutered male might remain more silly and scatterbrained longer (which some might think is a good thing – “puppyish forever!” – but it could also mean slower to learn self-control). On the flip side, that intact male might challenge other males as he matures, which requires management. But once he passes through that phase, he often becomes a well-settled adult.

There's also something to be said about **trainability**: The 2024 study noted neutered dogs were **less trainable** on average. This could be because intact dogs are often more motivated (testosterone can increase drive and focus in some contexts, which sport trainers sometimes like). Or it might be that the intact

dogs in the study were working more with their owners (since intact dogs often belong to more engaged owners, whereas casual pet owners tend to neuter — that's speculation though). In any case, I have not found Golden Retrievers to be any less trainable when intact. In fact, some of the most biddable, eager-to-please Golden Retrievers I've met were intact males who had strong focus and drive to earn rewards. Neutered Golden Retrievers can be great too, of course — the point is, I don't see a **behavioral advantage** to neutering for training; if anything, a slight disadvantage might exist.

- **Male vs Female Differences:** We should note that behavioral effects of neutering can differ by sex. Neutered males often show a reduction in mounting and urine marking, which many owners appreciate. Intact males, especially in multi-dog households, might mark indoors or obsess over nearby females in heat. These are manageable but real behaviors. For females, the main behavior issue intact is dealing with heats — some will cry or try to escape to find a mate when they are in peak estrus, which can be annoying or risky. But outside of those 2-3 weeks, they're normal dogs. Spayed females don't have those swings at all. In terms of aggression, some studies have found spayed females can be more aggressive (perhaps due to lack of estrogen, which has a calming effect). In shelters, it's noted that female dogs with minimal lifetime exposure to estrogen (i.e., spayed very young) might show more reactivity, though results are mixed. Golden Retrievers are typically very gentle whether intact or spayed, but if one had a slight edge to her temperament, I'd actually be inclined to keep her intact longer to see if maturity smooths it out rather than spay early and risk making her more anxious.
- **Roaming and Recall:** This is a practical behavior aspect. Intact males have a strong drive to roam if they sense a female in heat nearby. This is a top reason many people neuter — to prevent the dog from busting out of the yard. It's a legitimate concern: the best-behaved intact boy can turn into Houdini if the scent of an in-heat female hits his nose. The solution if you choose not to neuter is excellent containment and recall training. A well-fenced yard, never letting the dog roam loose unsupervised, and drilling a rock-solid recall (so if he does get loose, he comes back when called) are mandatory. Many European owners manage this just fine; it's a bit of extra work. For Golden Retrievers, who are quite trainable and human-oriented, teaching them to stick by you and come when called is usually very achievable — often easier than with some independent breeds. So in my view, a responsible Golden owner can keep an intact male without him ever roaming; it just requires mindfulness. For females, ensuring they are securely confined during heat is key — and possibly skipping dog parks during that time, for everyone's sanity.

- **Humping and Sexual Displays:** Yes, intact dogs are more likely to hump or display sexual behaviors. But let's bust a myth: **neutered dogs hump too** – often as a dominance or play behavior, not sexual. I've seen plenty of neutered Golden Retrievers embarrass their owners by mounting another dog during playtime. Meanwhile, I've known intact males who have superb manners and never attempt to hump people or dogs because they were taught boundaries from puppyhood. Humping can be training issue as much as a hormone issue. Neutering will reduce the *sexually driven* mounting (like the dog that obsessively tries to hump any female dog he meets – that's likely hormonally fueled and neuter would help). But a lot of mounting in social settings is about excitement or control, which training addresses. So, one benefit of keeping your dog intact is you get a chance to train him out of those behaviors properly. If you succeed, you have an intact dog with manners. If you struggle, neutering is still there as an option to dial it down.

**In summary, from a behavioral standpoint, delaying spay/neuter or keeping a dog intact is quite compatible with having a well-behaved Golden Retriever**, provided you invest in training and management. The old argument that intact dogs are aggressive or unmanageable doesn't hold water for the vast majority of Golden Retrievers. In fact, science is starting to back up what some trainers have long suspected: hormones can positively influence behavior by promoting confidence, focus, and normal social development.

For a holistic view, I also consider the dog's psychological well-being. Going through puberty and adulthood normally might be psychologically beneficial. It's hard to measure that, but one could argue that allowing a dog to experience those natural drives (even if we don't allow them to fulfill them by breeding) is part of a rich life experience. As long as it's not causing frustration (and in males, it typically doesn't cause constant frustration unless an in-heat female is very near; in females, they might be a bit frustrated during heat, but it's brief), I think there's value in natural development.

That said, if a particular dog's behavior is truly problematic and we suspect hormones are a big factor, neutering can be considered on a case-by-case basis even if the dog is young. For example, a male dog that is extremely dominant or getting into fights might calm down a bit without testosterone. Or a female that has false pregnancies that affect her mood might do better spayed. The key is to assess *individual behavior*, not assume all intact dogs will be hooligans or all neutered dogs angels. Many Golden Retrievers remain as sweet and goofy as ever whether you neuter them or not; their inherent temperament shines through.

Next, we'll explore an exciting middle ground: **alternative sterilization methods** that can give us the best of both worlds – population control without sacrificing hormones.

This is where modern veterinary options like vasectomy and ovary-sparing spays come into play, which more owners are starting to consider for the long-term welfare of their pets.

### **Alternatives to Traditional Spay/Neuter (Vasectomy and Ovary-Sparing Spay)**

For dog owners who want to prevent puppies but also want to preserve the health benefits of hormones, the **traditional spay (ovariohysterectomy) or neuter (castration)** isn't the only path. Alternative surgeries like **vasectomies for males** and **ovary-sparing spays (OSS) for females** are gaining attention. These procedures sterilize the animal (so they cannot reproduce) but **leave the sex organs intact**, meaning the dog continues to produce hormones. It's like a contraceptive approach versus a gonad-removal approach. Let's break down what these entail and their pros/cons, especially regarding Golden Retrievers:

- **Vasectomy (for Males):** A vasectomy is a surgery where the **vas deferens** (the tubes that carry sperm from the testes) are cut or tied off. The dog still has his testicles, so he still produces testosterone and sperm, but the sperm can't travel to cause a pregnancy. From the outside, nothing much changes; the dog looks intact, acts intact, and even **can mate in terms of the physical act** (he can still tie with a female), but he will not father puppies. The recovery from a vasectomy is similar to a neuter (small incision, relatively quick healing). The big benefit is the dog's hormonal balance remains untouched. For a Golden Retriever male, a vasectomy would allow him to keep growing normally, maintain muscle, perhaps have that protective effect against certain health issues we discussed, and avoid potential behavior changes from loss of testosterone.

The downsides: a vasectomized male will still **behave like an intact male** in terms of interest in females. If a nearby female is in heat, he will be just as eager to get to her as an intact male (and he physically can still mount her). So all the management of an intact male still applies – you haven't "calmed him down" at all. The only difference is if he somehow does mate with a female accidentally, no litter will result. Some owners might find that insufficient benefit for the trouble, while others see it as a great solution to health concerns while being responsible about population control. Another consideration: if a vasectomized male ties with an intact female, she could still be at risk of injury or infection, and it might be hard to convince people he's "safe" if they don't understand he's fixed in that way. So, practically, most doggy daycare or boarding places will consider a vasectomized dog as "intact" because he still has testicles and behaves like it. This may limit social opportunities since many such facilities have blanket rules. That's an external factor to consider.

- **Ovary-Sparing Spay (for Females):** Often called OSS or hysterectomy, this procedure removes the **uterus (and usually the cervix)** but **leaves one or both ovaries** intact. The result: the female cannot get pregnant (no uterus for puppies to implant), and she's at essentially zero risk for pyometra (because the uterus, which gets infected in pyo, is gone). However, her ovaries still produce estrogen and progesterone on their normal cycle. She will still come into heat on schedule and show all the signs – swollen vulva, possibly some bleeding or discharge (though with no uterus the bleeding is significantly reduced, but some vaginal discharge may occur), and she will still attract male dogs. She could even mate and tie with a male; of course no pregnancy would occur, but the mating act could be problematic if it happens unwatched (risk of injury or infection, and the male might be frustrated). So an OSS female must be managed during heat just like an intact female – kept away from males. Behaviorally and physically, an OSS female is essentially an intact female who can't have puppies. She will benefit from her hormones for bone, joint, and overall health. Many owners who choose OSS report that their dogs go through heat cycles normally but perhaps with less mess, and otherwise they enjoy the peace of mind that there won't be any accidental litters.

The downsides of OSS: As mentioned, the female will still go into heat, which some owners might not want to deal with. You still have spotting (though often less than a full heat since the uterus is the main source of bleeding; the vagina can still produce some blood). The dog will still have hormonal mood swings – some OSS owners say their dog's heats are milder in terms of behavior, others say they're the same as before. Another consideration is that OSS is a somewhat specialized procedure – not all vets are trained or comfortable doing it. The surgeon has to be careful to remove all of the uterus and cervix to prevent stump pyometra (an infection in any remaining bit of uterus tissue). If any uterine tissue is left while ovaries remain, the dog could still theoretically get a type of pyo, so expertise is important. Finding a vet who will do an OSS may require some searching (though there are directories now for veterinarians who offer hormone-sparing sterilizations).

- **Health Implications of Alternatives:** Both vasectomy and OSS essentially provide the **health profile of an intact dog** (since the gonads remain). So all the health benefits of staying intact (better orthopedic outcomes, lower risk of the cancers we talked about, no spay incontinence, etc.) would apply. The only health difference is that an OSS female, by removing the uterus, eliminates pyometra risk entirely, which intact females have. So an OSS could be viewed as health-superior to full intact status in that one regard. An intact female might have ~20-25% chance of pyo by old age; an OSS female has 0% chance. That's a big plus. The OSS female does still have mammary cancer risk, because it's the

presence of ovaries that influences that; however, since you can choose when to do an OSS, some owners might let their dog have a couple heats then do OSS to balance mammary tumor risk (similar to late spay). But if you leave ovaries for life, you haven't reduced mammary tumor risk at all compared to intact – that's one trade-off to be aware of. For vasectomized males, healthwise it's the same as intact: risk of testicular tumors remains (though that's low risk and easily dealt with), risk of prostate issues remains (neutering later can address that if needed), etc.

- **Behavior Implications of Alternatives:** Because hormone levels are unchanged, a vasectomized male may still have all the same hormone-driven behaviors as an intact male (marking, potential aggression to other males, etc., if those exist). Training is needed just like any intact dog. An OSS female will still flirt with males and may still have mood changes around her cycle (some get a bit needy or cranky during diestrus or false pregnancy). So alternatives do **not give behavioral benefits** of neutering; they explicitly trade those away to keep health benefits. For a breed like Golden Retrievers, which typically don't have severe hormone-driven behavior issues, this trade is usually fine. If someone had a dog who was extremely hard to manage during heat or a male who was very aggressive with other males, these might not be suitable – though one could argue training and management could still work.
- **Availability and Cost:** As of now, not every vet clinic offers these alternatives. But interest is growing. Organizations like the Parsemus Foundation actively promote hormone-sparing sterilization, citing the research that shows long-term health benefits. World Small Animal Veterinary Association (WSAVA) in 2022-2023 even included guidelines acknowledging alternatives as valid options. Cost-wise, a vasectomy or OSS might cost similar or slightly more than a traditional spay/neuter since they are less common and take maybe a bit more surgical time (especially OSS, as it's essentially a spay but leaving ovaries, which requires careful ligation). But for many, the cost difference isn't huge in the context of a dog's lifetime.
- **Public Perception and Responsible Ownership:** One tricky thing is explaining to others that your dog is "fixed" even though they appear intact. I've had to clarify to other owners, "Yes, he still has testicles, but he's had a vasectomy, so don't worry about your female." It can be an awkward conversation at the dog park! Some owners might choose to put a little marker on the dog's collar tag that says "Neutered by vasectomy" or something to avoid misunderstandings. The same goes for OSS females—an intact-looking female at a dog park might alarm people if there are males around. So, many OSS owners simply avoid dog parks during heats (which you'd do anyway) and otherwise it's not an issue.

One might ask: if you're going to do a vasectomy or OSS, why not just keep them fully intact? The answer for many is **peace of mind and safety**. Mistakes happen—doors get left open, fences break, or a kid walking your dog might not notice an approaching stray. If a vasectomized male slips out, at least he won't cause a litter if he finds a female in heat. If an OSS female accidentally encounters a male, she won't end up pregnant. This can be especially important in multi-dog households: say you have a male and female and you'd like to keep both intact for health, vasectomizing the male or doing OSS on the female will ensure you don't have an "oops" litter in your own home. It's a way to have your cake and eat it too – hormones intact, reproduction off the table.

For Golden Retrievers, who often live in family environments where management is feasible but not foolproof, these alternatives are worth considering. Imagine a scenario: you adopt a brother-sister pair of Golden puppies. You want them to grow naturally, but you obviously cannot have them making puppies together. You could vasectomy the male at 6 months (a simpler surgery than neuter in some ways, with fewer long-term effects) and allow both to grow up with their hormones. The female will go into heat; you keep them apart during that time. No accidental litter, and both get the health advantages of remaining "intact" in hormone terms. It requires commitment, but it's doable.

I find it exciting that veterinary medicine is evolving to recognize these methods. It aligns with a more nuanced view of pet care – not everything has to be all or nothing. As Dr. Benjamin Hart and others have argued, decisions on if and when to neuter should be individualized. Alternatives expand the menu of choices: it's no longer just neuter early, neuter late, or leave intact; you can also "half-neuter" in a sense (remove reproductive capability but not hormones).

Owners interested in these options should talk to vets who are open-minded. It sometimes takes educating your veterinarian because some were not taught these procedures in school, or they might have outdated concerns (e.g., "But an OSS female will still get pyometra," which isn't true if done properly). Resources and directories from organizations like Parsemus can help find a vet experienced in this area.

The existence of alternatives underscores the central theme here: **prioritizing long-term well-being and natural development, while also being responsible about pet population control**. It's literally the best of both worlds if executed correctly.

### **Golden Retrievers: Breed-Specific Considerations and Findings**

Let's zero in on Golden Retrievers now, tying all these threads together specifically for the breed. Why have Goldens been at the center of so many spay/neuter studies and discussions?



- **Popularity and Study Size:** Goldens are consistently among the top breeds in popularity. This means veterinary researchers have large sample sizes and medical records to analyze. The 2013 UC Davis study that kicked off a lot of conversation was focused on Goldens because they had **759 Golden Retrievers' records** to draw upon. A breed so popular serves as a good bellwether for how spay/neuter might affect dogs in general. Moreover, Golden owners tend to be very invested in health research (witness the Golden Retriever Lifetime Study by Morris Animal Foundation, which enrolled 3,000 Goldens to track their health over life – one of the largest long-term studies of its kind).
- **Genetic Predispositions:** Goldens unfortunately carry a high genetic risk for certain cancers, notably hemangiosarcoma and lymphoma. About 60% of Golden Retrievers may die from cancer, according to some studies – one of the highest rates among breeds. This predisposition means any environmental or lifestyle factor (like spay/neuter) that *further* increases cancer risk is a huge concern. When the UC Davis research found spay/neuter elevating cancer rates in Goldens, it hit home for many owners: if we can tweak something in management to reduce even a bit of that cancer risk, it's worth it.
- **Joint Issues in Goldens:** Goldens are active, outdoorsy dogs that love to run and play. While not as heavy as some other breeds, they are still prone to hip dysplasia and knee injuries. The fact that early neutering can quintuple a Golden's chance of a joint disorder is extremely relevant. A limping Golden who can't hike or fetch is a sad sight, and it's something we want to prevent if possible. The breed's role as service dogs and athletes (many do agility, obedience, hunting, etc.) also underscores the need for sound joints. It's not surprising that one of Dr. Christine Zink's early pushes against blanket spay/neuter came from the sports dog community noticing issues in their spayed/neutered canine athletes. Golden Retrievers, as common participants in these activities, are part of that story.
- **Behavior and Role:** Goldens are often family dogs, therapy dogs, and just all-around friendly pets. They are not typically kept intact for breeding unless they are show dogs or used by breeders; the average pet Golden has traditionally been neutered early. But as more trainers and owners learn about the potential benefits of delaying, Goldens have become a breed that many trainers (like myself) use as an example: "If you have a Golden, especially a male, you might really want to wait to neuter because it can make a big difference." Why especially a male? Because, as mentioned, the case for neutering males for health is weak (no heat cycles or pyometra to worry about), and Goldens have that male-specific spike in lymphoma when neutered early. So a lot of the current advice for Goldens is: for males, consider leaving intact or at least waiting until

~18-24 months; for females, consider waiting until at least after one heat or even later, balancing mammary tumor risk and orthopedic/cancer risks.

- **Breed Club Recommendations:** The Golden Retriever Club of America (GRCA) has not issued a strict edict, but they do acknowledge recent research. Many Golden rescue organizations also have shifted policies – some used to spay/neuter at 6 months, now they might allow adopters to wait, or they neuter older if the dog is healthy. In the UK, the Golden Retriever Club's Code of Ethics says not to spay before 2 years if possible, if I recall correctly. This shows that those intimately familiar with the breed are taking the research seriously. I've seen breeder contracts that forbid early spay/neuter for the dog's welfare (some breeders void health guarantees if you neuter too early, because they believe it contributes to orthopedic problems which they don't want to be blamed for – that's telling!).
- **Golden Retriever Lifetime Study Insights:** While the final results of that study are still years away, there have been interim papers. One published finding was that spayed females in the cohort had a higher incidence of certain cancers compared to intact – aligning with what we've discussed. Also, they observed that being neutered was associated with obesity (again not surprising). This ongoing research may soon give us even more breed-specific data. Golden Retrievers are almost a “canary in the coal mine” for spay/neuter effects: if something shows up in Goldens, it alerts researchers to look at other breeds. For example, after the initial Golden study, the UC Davis team did similar studies on Labradors (who showed fewer ill effects than Goldens – Lab cancer rates weren't as influenced by neuter, interestingly), and on German Shepherds, then on 35 breeds (with breed-specific charts). Goldens remained one of the breeds where early neuter had the **most pronounced negative effects**, especially on joints and some cancers. It's hypothesized that breeds that have been heavily selected (and maybe inbred) might be more sensitive to any additional risk factor – Goldens have some inbreeding in their history, which may amplify predispositions.
- **Holistic and “Natural” Community:** Goldens are popular among those who favor holistic pet care (perhaps because they themselves have gentle personalities and attract owners who are nurturers). Within these communities, there's a push towards more natural rearing – delayed vaccines, raw diets, and indeed, not spaying/neutering too early. So there's a segment of Golden owners who are already on board with later spay/neuter. They often share anecdotes like “I had two Goldens; the one I neutered at 6 months got osteosarcoma at 7 years, the one I neutered at 3 years is still healthy at 10.” While anecdote isn't data, these stories spread and reinforce the research findings in a personal way.

- **Emphasizing Well-Being:** From Just Behaving's perspective, the ultimate goal is a Golden who is **physically healthy and behaviorally well-adjusted for as long as possible**. If keeping them intact a bit longer helps achieve that, it's worth consideration. We also want them to be good canine citizens, and that comes from training and socialization. Golden Retrievers are so biddable that I truly believe most intact Golden Retrievers, in a caring home, will not become a problem to society. They're not the dogs roaming the streets causing trouble; with rare exceptions, they stick close to their families. So the breed's very nature allows more flexibility in delaying neuter without high risk of, say, unwanted litters or dog fights.

To crystallize the Golden-specific findings from research:

- **5x increase in joint disorders** (like CCL tears) in Golden Retrievers neutered before 6 months. This is stark and often cited. It suggests Golden Retrievers are especially sensitive to the orthopedic effects of early neuter.
- **Higher cancer incidence** (lymphoma, hemangio, MCT) in neutered Golden Retrievers, whereas Labrador Retrievers did not show this increase. So what's fine for a Lab might not be fine for a Golden. Breed matters.
- **No significant effect in small breeds.** Unlike Golden Retrievers, small dogs didn't show the same joint/cancer risks when neutered. This highlights that for a Chihuahua or Mini Poodle, early spay might be inconsequential for health, but for a Golden, it's consequential. This breed-by-breed approach is now recommended by many vet schools.
- **Behavioral impact might be subtle but present.** While Golden Retrievers are not typically aggressive, any increase in anxiety or noise phobia from early neuter would be a shame in a breed celebrated for its stability. So keeping them intact through maturity could help ensure they develop that classic Golden confidence fully.

In light of all this, **what are current best practices** for Golden Retriever spay/neuter timing? Many experts now say:

- For **male Golden Retrievers**: strongly consider waiting until **at least 12 months old**, and preferably 18-24 months, to neuter. Some may even choose not to neuter at all unless needed. During that time, manage the dog to prevent breeding and address any adolescent behavior with training.
- For **female Golden Retrievers**: consider allowing **one or two heat cycles** (which typically means spaying around 12-18 months at the earliest, or around 2 years if two heats) to gain musculoskeletal benefits. If the owner is comfortable, possibly even keep intact indefinitely with good management, or pursue an OSS

after maturity. If spaying earlier for a specific reason, definitely not before 6 months – at least wait until the growth plates are nearing closure (~a year).

- In both cases, if the dog is a high risk working dog (like a guide dog program where they traditionally neuter early for ease of placement), organizations are now looking at adjusting those policies too because a guide dog with hip dysplasia or cancer is a failed guide dog. Some service dog orgs have started vasectomies for males to keep the health benefits while controlling breeding.

One might worry: *Won't all these intact Goldens lead to more Golden puppies and exacerbate overpopulation?* Realistically, most Golden owners are not going to breed their dogs just because they kept them intact for 2 years. They are simply waiting and then neutering or doing alternatives. The overall impact on population is negligible if owners are educated. The overpopulation issue these days is far more about unplanned litters of mixed breeds and stray dogs in certain regions, not well-loved Goldens escaping to mate (though that can happen, it's rare if the owner is responsible). The culture is also shifting: instead of demonizing intact pet owners, the conversation is slowly moving to “responsible intact ownership” as a valid choice.

Given how much we love our Goldens, it's heartening to see that what's best for them individually (health-wise) is now being taken seriously. Golden Retrievers give us their all – loyalty, love, and companionship. The least we can do is make thoughtful decisions about their care, even if it means questioning decades of conventional advice.

### **Conclusion: Rethinking the 6-Month Rule for the Sake of Our Goldens**

The journey through this research has been eye-opening and affirming. We started with a simple question about the optimal timing for spaying or neutering Golden Retrievers, and we uncovered layers of history, science, and nuance that turn a once-straightforward decision into a personalized calculus. In writing these notes from my perspective as Dan (owner of Just Behaving), I've tried to maintain a thoughtful, somewhat skeptical stance – not to be contrarian for its own sake, but to genuinely weigh the **long-term well-being** of the dogs we care so much about against practices we've taken for granted.

**Challenging the Status Quo:** It's not easy to go against ingrained norms. Spay/neuter at 6 months has been almost a rite of passage for puppies in the U.S. for the last half-century. But the evidence we've compiled – especially as it relates to Golden Retrievers – strongly suggests that this one-size-fits-all recommendation is outdated. The original rationale (population control) is still important, but we can achieve that without sacrificing health by choosing *when and how* to sterilize more intelligently.

**Holistic Perspective:** When we consider the dog as a whole – body, mind, and their place in our family – it becomes clear that decisions around spay/neuter should be as

individualized as any other major health decision. What is right for a tiny lapdog in a city apartment might not be right for a Golden Retriever who goes hiking every weekend. A holistic approach means **looking at the natural development of the dog**, understanding the role of hormones, and striving to minimize the risk of debilitating diseases. It also means considering the dog's emotional development and ensuring we aren't inadvertently causing anxiety or behavioral issues by altering them too early.

**Summary of Key Points:** For Golden Retrievers, the weight of evidence suggests:

- Allowing them to grow with their hormones at least until adolescence is completed (12-18 months) can **reduce orthopedic problems and may help temperament**.
- Delaying spay/neuter or using alternatives can **lower their risk of certain cancers** that commonly affect the breed.
- Any decision to keep a dog intact should come with a commitment to responsible management – a responsibility most Golden owners are more than willing to accept for the sake of their dog's health.
- There are **safe alternative procedures** (vasectomy, ovary-sparing spay) that can offer a win-win: no puppies, but a healthy dose of hormones retained. These are worth discussing with veterinarians

**Voice and Philosophy:** Throughout these notes, I've spoken in a voice that is questioning yet caring – which is how I approach things at Just Behaving. As a trainer and a dog owner, I've learned that doing what's always been done isn't always the best path. Sometimes we have to step back and ask, "Why are we doing this, and is it truly benefiting the dog in front of me?" That curiosity and willingness to adapt is what leads to better outcomes. I've also tried to keep the tone grounded and not alarmist. Not every spayed Golden will suffer these issues, and not every intact one will be problem-free. But statistically, we can improve their odds. It's about stacking the deck in favor of a long, healthy, happy life.

**Empowerment Through Knowledge:** My hope is that these research findings empower Golden Retriever owners (and really, all dog owners) to have informed conversations with their vets and make choices that align with both the dog's health needs and the owner's ability to manage. It's not about imposing one right answer; it's about recognizing that the *optimal timing* can vary. For some, that might still mean a traditional spay at say 1 year old, for others it might mean a vasectomy at 6 months and never doing more, for another it could be no spay at all unless a health issue arises.

**Looking Ahead:** The paradigm is shifting. Veterinary schools are teaching the new data, shelters are considering the effects of pediatric neuter on the animals' future

health, and some are adopting contracts that allow adopters to neuter at a later age instead of doing it at 8 weeks. Breeders are educating puppy buyers on the reasons to wait. We are essentially witnessing a change in a cornerstone of pet care. It reminds me of how child pediatricians once all recommended tonsil removal at the drop of a hat, and then pulled back when they realized it wasn't always necessary. We're having that moment in veterinary medicine with gonad removal. Golden Retrievers happened to be the messengers that sounded the alarm, due to that 2013 study and subsequent research.

In concluding this deep dive, I circle back to the individual Golden Retriever – your Buddy or Daisy snoozing at your feet. This dog trusts us to make the best decisions for them. It's a weighty responsibility, but science is giving us clearer guidance now. The **optimal timing for spay/neuter** might not be a single age for all Goldens, but one thing is increasingly clear: **the conventional 6-month mark is rarely optimal for this breed's long-term health**. By considering each dog's development, using modern alternatives, and focusing on overall well-being, we can do better by our Goldens.

Ultimately, the **goal is to have our beloved Goldens live as long and vibrant a life as possible**, free from avoidable health issues and with their wonderful personalities intact (pun intended). Questioning the old norms and embracing new knowledge is just part of loving and advocating for our dogs. After all, when we know better, we can do better – and our Golden friends certainly deserve the best.