

A Review of Sterilisation Practices in Dogs and Cat and Impact on the Individual Animal



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Introduction

Gonadectomy or neutering refers to the removal of the gonads (testis or ovaries). The words spaying and castration refers to gonadectomy of the female and male domestic animal, respectively. Gonadectomy is the most common surgical procedure performed in small animals worldwide, it is thus important that veterinary surgeons acquaint themselves with the advantages and possible adverse effects of gonadectomy in order to make recommendations and assist pet owners in making informed decisions. These recommendations may differ depending on country, cultural perception, the species, gender and age of the pet and the preferences and skill of the veterinary surgeon.

Clients expect us to base our recommendations on science, rather than on anecdotal evidence or tradition [1]. Within local context, the majority of veterinary surgeons recommend sterilisation at the age of 6–12 months for all pets not intended for breeding. The purpose of this article is to help the veterinarian make the most appropriate recommendation for pets on an individual basis.

Benefits of gonadectomy in domestic, feral and wild dogs and cats

Although the primary intention of a gonadectomy is to sterilize the pet, there are numerous health and other benefits.

Bitches that have been spayed do not attract males, are less likely to fight or cause fights, do not roam in search of a breeding partner and no longer exhibit "in-season" vaginal bleeding which can be a nuisance to owners. The medical benefits of sterilisation in bitches include a decrease in the incidence of mammary neoplasia. Mammary neoplasia is the second most common tumour type reported in female dogs after skin tumours with an incidence of 27.1% [2]. The greatest benefit occurs if the bitch is spayed before her first oestrus, in which case the risk of mammary neoplasia is reduced to 0.05%, 8% when performed after the first oestrus, and 26% after the second

oestrus [3]. Ovariohysterectomy also prevents ovarian and uterine neoplasia and pyometra [4].

For owners of queens, the signs of oestrus such as increased vocalisation, rolling and a short inter-oestrous interval prompt the owner to seek a method of oestrus control [5]. The health benefits of sterilisation in queens include a decreased incidence of mammary, ovarian and uterine neoplasia as well as pyometra [4]. Mammary neoplasia is the third most common tumour of female cats, with a reported incidence of 2.5%. The incidence of mammary neoplasia increases with the number of oestrous cycles in the cat's life [6].

In male dogs, castration has numerous advantages in addition to sterilisation, mainly related to removal of the main source of testosterone. Castration controls urine marking in most males and reduces the tendency to roam in search of in-season bitches [7]. A common misconception is that castration is highly effective in reducing aggressive behaviour in male dogs. Castration may ameliorate the aggression slightly but other methods such as behavioural modification and training need to be explored [8].

The health benefits of castration are mainly due to a decrease in circulating testosterone and include a decreased incidence of benign prostatic hyperplasia (BPH), testicular neoplasia and perianal adenomas [68]. BPH is the most common of these conditions, with a reported incidence of 75–80% in uncastrated dogs, 6 years and older [9]. Michell reported that castration in dogs may be associated with an increased lifespan, but whether this is directly related to the health benefits of castration or the altered behaviour reducing the risk of fighting and roaming, is currently unknown [10].

Few doubt the necessity of neutering tomcats which are kept as pets. Intact tomcats are very unsociable due to their persistent habit of urine spraying, roaming and fighting, leading to treatment for abscesses and an increased likelihood of contracting infectious diseases [11]. There is no health condition reported to increase



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or decrease in association with gonadectomy in male cats. Numerous studies have evaluated the effect of castration in male cats at various ages with urethral diameter and the incidence of urinary tract obstruction and none have documented a correlation [12].

Cat and dog breeders will often elect gonadectomy of their breeding stock they no longer wish to breed with and to enforce breeding restrictions on puppies and kittens they sell to new owners.

Epidemiologists have an interest in population control of stray and feral dogs and cats as they act as reservoirs of zoonotic diseases such as rabies and pose a threat to other animals and mankind [13]. Populations of stray and feral dogs and cats are also of interest to environmentalists as they threaten certain species with extinction through hybridization e.g. the Ethiopian wolf or through predation e.g. 100 million birds and mammals per annum are predated on by dogs and cats in the United Kingdom [14;15].

Adverse effects of gonadectomy

The reported incidence of post-surgical complications in cats is 2.6%, with most complications being mild and self-resolving [16]. The incidence of obesity in cats after spaying is high and is due to the decreased metabolic rate post-gonadectomy. However, this can and should be controlled by a proper feeding regimen [17]. There is a reported increase in the incidence of both feline lower urinary tract disease (FLUTD) (0.6%) and diabetes mellitus (0.5%) in spayed queens [18]. A very small number of queens may develop urethral sphincter incompetence (USI) but the correlation to spaying is unclear [11].

The incidence and morbidity of mammary gland neoplasia and pyometra are much higher than the incidences of FLUTD and diabetes mellitus and therefore the recommendation for early routine sterilisation of cats not intended for breeding is justifiable [12].

Adverse conditions reported following castration in male dogs include complications of surgery [16] as well as a very small increased risk of neutered dogs to develop cancer of bladder and prostate with an odds ratio of 3.56 (3.02–4.21) for urinary bladder TCC, 8.00 (5.60–11.42) for prostate TCC, 2.12 (1.80–2.49) for prostate adenocarcinoma, 3.86 (3.13–4.16) for prostate carcinoma, and 2.84 (2.57–3.14) for all prostate cancers (n = 2219) [19]. The latter risk varies by breed suggesting that genetics play a role in the development of these diseases [20]. A twofold excess risk for osteosarcoma was observed among neutered dogs [21]. The prevalence of anterior cruciate ligament rupture in all dogs is 3.48%. Sterilised male dogs had a higher (2.1-fold greater) prevalence of anterior cruciate ligament rupture than the sexually intact dogs [22]. An increased tendency towards obesity and obesity related conditions exists [23;24] with 32% of neutered

male dogs being obese as opposed to 20% of intact males [25]. Similar increases have been reported for male cats [26]. USI in male dogs (intact and neutered) is very rare (exact numbers not reported but Boxers and castrated males were over-represented) [27;28].

The possible complications of surgery that may occur during sterilization of bitches are much more severe than those seen in male dogs [16]. These may include haemorrhage, ovarian remnant syndrome, stump pyometra, stump granuloma, fistulous tracts, eunuchoid syndrome and accidental ureteral ligation [29]. As with male dogs, there appears to be an increased incidence in certain neoplasms in some breeds following spaying of bitches. A twofold increased risk for osteosarcoma was observed among spayed bitches [21]. The prevalence of anterior cruciate ligament rupture in all dogs is 3.48%. Sterilised Bitches 2.1-fold greater prevalence of anterior cruciate ligament rupture than the intact dogs [22]. Compared with sexually intact females, spayed females were at increased risk for developing splenic haemangiosarcoma (odds ratio, 2.2; 95% confidence interval, 1.2–4.1) [30]. An increased tendency towards obesity and obesity related conditions exists in spayed bitches [23;24] with 32% of spayed bitches being obese as opposed to 23% of intact bitches [25].

In addition, the bitch may have a possible increase in aggression, an effect proven in the English Springer Spaniel [31]. If a bitch is spayed in late dioestrus, transient lactation and mammary development may occur due to a drop in circulating progesterone levels triggering an increase in prolactin secretion [29].

An adverse effect of spaying that requires in-depth discussion is USI. This is a very common sequel to spaying bitches and may greatly influence the decision to spay by owners with prior experience of a pet with urinary incontinence. Spayed bitches may develop urinary incontinence within days of the surgery or more commonly, several years later (average 2–3 years). Although any size bitch may be affected, large and giant breeds appear to have a higher risk of developing USI, with the principal affected breeds in one study, including Doberman, Old English Shepherd dogs, Rottweilers, Weimaraners, Springer Spaniels and Irish Setters [32–34]. Within local context, Boerboel bitches appear to be over-represented (personal observation, De Cramer).

Reports on the incidence of USI vary between 4–20% [35;36] in spayed bitches and (0–1%) in intact bitches [36]. Ovariohysterectomy (OVH) in bitches significantly increases the risk of USI. Although many bitches will respond to life-long oestrogen replacement therapy or alpha-adrenergic agonist therapy, certain cases may be difficult to control and may require alternative therapies such as surgery, injection of bulking agents or a combination of the two modalities. Also based on cases presented in one study, large and giant

breeds appear to suffer from more severe leaking and are more likely to be unresponsive to treatment and present for surgical treatment for USI more frequently than do smaller breeds [37]. Obesity can worsen urinary incontinence and it is important to note that that obesity is also linked to gonadectomy.

Although there are potentially severe consequences of spaying female dogs which should be discussed with the owner, in these authors' opinions, the medical benefits with regard to the decreased incidence of mammary neoplasia and pyometra and ultimately the longevity of the bitch, behavioural benefits and guaranteed prevention of unwanted pregnancies, justifies the recommendation of early routine sterilisation of bitches not intended for breeding, in our society.

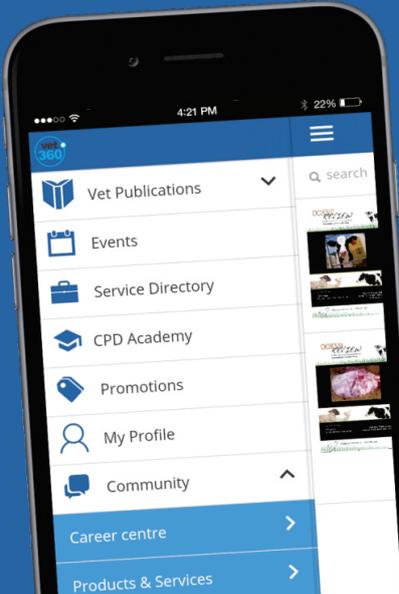
Resistance to sterilizing pets

Despite the numerous benefits, many dog owners are still hesitant to have their pets sterilised. These owners are often influenced by the host of on-going studies regarding possible adverse effects of sterilising pets as well as anecdotal and unsubstantiated reports gleaned from the internet, friends and family. With regards to sterilisation of pets, it is fair to state that the advantages on both the pet's long-term health and behaviour far outweigh the disadvantages in most instances and most breeds. This is particularly true where the owner cannot guarantee the prevention of unwanted pregnancies in female pets. Veterinary surgeons should have the up-to-date knowledge to be able to guide these unconvinced owners into making an informed decision both for the benefit of their pet and the community as a whole.

Dog owners and breeders often put a great deal of time and commitment, both personal and financial, into showing and working their dogs in various arenas and are therefore understandably concerned

regarding the effects of sterilization on their animal's behaviour. These effects are difficult to measure due to the non-objective parameters with which they are measured. It is therefore not surprising that there is no clear consensus on what the real effects are. It is also important to realise that breed, gender and individual differences will also have an effect on the manifestation of behavioural changes following gonadectomy. The effects that have been studied by Duffy and Serpell (2006) include: stranger directed aggression, owner-directed aggression, dog-directed aggression, trainability, excitability and the effect on the energy levels of a dog. The results of this study suggested that spayed females tend to be slightly more aggressive or assertive toward their owners and strangers than intact females and that both genders have slightly reduced energy levels and drive following sterilisation. This is generally the main reason why some owners are reluctant to sterilise competition and working dogs.

Certain Scandinavian countries either prohibit the routine surgical sterilization of dogs or strongly discourage sterilization of pets unless there is a valid medical reason. Their rationale is that routine sterilisation exposes them to an increased likelihood of adverse effects associated with gonadectomy and that, in their opinion, the prevention of these effects outweighs the known reproductive health benefits offered by gonadectomy. They further support their argument by showing that the failure to routinely sterilise animals does not lead to pet overpopulation and unwanted litters in their society and that they generally have a much lower number of abandoned pets requiring euthanasia as opposed to those countries that are strong proponents of routine pet sterilisation. Veterinary surgeons should understand that there are pet owners who share the views of these Scandinavian countries. These owners also recognise the importance of preventing unwanted litters from



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their pets and are willing to either ensure that their bitches are not mated or to explore contraceptive alternatives that do not require surgical intervention and possible subsequent adverse effects.

In some countries, certain dog owners (mainly men), find the emasculated look of an empty scrotum on their male dogs almost too much to bear and refuse to have the dog castrated, although this sentiment is often not carried over to their female dogs! For these owners, the option of Neuticles® (www.neuticles.com) was developed. Neuticles® are prosthetic testicular implants for neutered dogs. Opinion is divided regarding their use: Some are of the opinion that they serve no purpose other than to entertain human vanity and therefore question the ethics of their use. It is not clear what the stance of our local veterinary regulatory body's (SAVC) stance is on the use of this prosthesis.

In certain societies, cultural perceptions and the value of the role (hunting or guarding) that dogs fulfil in the community may act as obstacles to efforts to convince dog owners to sterilise their pets. These dog owners may wish to replace their dog by breeding another one themselves from the original pet, rather than having to buy one if they had had their dog sterilised.

Surgical sterilization

Despite many advances in contraceptive techniques, permanent and irreversible surgical sterilisation by removal of the reproductive organs is still by far the most common method [1;29]. In bitches and queens, surgery can be performed conventionally through a surgical incision in the abdominal wall (mid-line or flank) or via laparoscopy [4]. Laparoscopic ovariohysterectomy and ovariectomy have been described in dogs [38;39] and wildlife [40] and are becoming much more widespread and acceptable techniques in veterinary practice. Laparoscopic surgery is gaining popularity due to its less invasive nature but the equipment is considered too costly for general practice by many practitioners. Increases in both surgical time and complication rates with laparoscopic surgery are stumbling blocks which are likely to improve with increasing expertise [4]. In the hands of experienced surgeons, surgical time is shortened for laparoscopic gonadectomy in bitches [39]. The main advantage is the decrease in post-operative pain associated with laparoscopic spay patients [41;42]. Laparoscopic surgery is by far the preferred method in human patients and this trend is likely to become true for pets as well in the years ahead.

Ovariohysterectomy versus ovariectomy

The method traditionally recommended to spay queens or bitches is ovariohysterectomy (OVH) [29]. An advantage of performing an OVH is that it completely eliminates the risk of these cystic endometrial hyperplasia pyometra complex and

uterine neoplasia abnormalities [43]. Bitches that have been spayed by ovariectomy (OVE) will only develop a pyometra if they are exposed to the effects of exogenous sources of progesterone.

It has been calculated that the true overall incidence of malignant uterine neoplasia in dogs is very rare (approximately 0.003%) [44] and uterine neoplasia has never been reported in a dog that has had its ovaries removed before 2 years of age, regardless of whether the uterus was left in situ [45].

Progesterone-containing products are becoming less readily accessible and there are fewer indications for their use, therefore, ovariectomised bitches should not inadvertently be exposed to sources of progesterone.

OVE, especially in pre-pubertal bitches is less invasive, less time-consuming and achieves the same goal and is therefore likely to gain in popularity over OVH [45]. In one study, it was concluded that there is no indication for removing the uterus during routine spaying in healthy pre-pubertal bitches and that OVE is the procedure of choice for this purpose [43]. OVH is technically more complicated, time consuming and is associated with greater complications due to larger incisions, more intra-operative trauma and increased discomfort when compared with OVE [4;46]. No significant difference between techniques was observed in respect of incidence of long-term urogenital problems, including endometritis, pyometra and urinary incontinence. Both OVE and OVH vastly reduce the risk of mammary adenocarcinoma if performed early (pre-pubertal) [29]. Therefore it may be safely concluded that OVE is the preferred method of gonadectomy in the healthy pre-pubertal bitch [44]. In older bitches with possible uterine pathology (cystic endometrial hyperplasia induced by prior progesterone priming during oestrus), OVH may be a better choice.

Age of sterilization

The optimum age for early gonadectomy in puppies is one of fierce debate, with veterinarians concerned about the long term health risks such as risk of infectious diseases, immune suppression, long bone growth, oestrogen responsive urinary incontinence and obesity [29]. For the purpose of this article, "early age neutering" is defined as the neutering of animals at the age of 6–12 weeks, "pre-pubertal neutering" refers to neutering at 3–5 months of age before puberty is expected a months or more later and "traditional age neutering" refers to neutering around 6–12 month of age when the bitch or queen may or may not have cycled.

Early age neutering is becoming increasingly popular all over the world. Enforced sterilisation in animal shelters prior to rehoming has been the main driving force behind early age sterilization. This stems from the fact that new owners of adopted pets seldom

fulfil the terms of adoption and fail to present the pet for sterilization when it comes of age. In order to enforce breeding restrictions, some breeders insist on puppy or kitten sterilization after weaning and prior to sale. The increasing popularity is also a result of the accumulation of data regarding the safety of the procedure and the lack of long-term adverse side effects when compared to animals which are gonadectomised at traditional ages.

As veterinary surgeons become more comfortable and familiar with the procedure, they are likely to encourage more clients to consider early-age neutering. Puppies which are neutered at an early age have a shorter recovery period as opposed to those neutered at a more traditional age. Mortality and morbidity rates are also reported to be lower [12] and it has been categorically proven that the pre-pubertal spaying of bitches reduces the incidence of mammary neoplasia to almost zero [3].

Two long term studies (48 month and 54 month median follow-up) showed that, on a short term basis, early age gonadectomy did result in an increased incidence of parvoviral enteritis, therefore it may be prudent to postpone sterilisation until one week after the completion of the vaccination regimen if non-exposure to an infectious virus cannot be guaranteed. Another disadvantage is a moderately increased risk of cystitis in early-neutered relative to late-neutered bitches (12.9% for bitches gonadectomised before 3 months of age and 5.0% for those gonadectomised at ≥ 3 months of age [12].

A study of the effects of pre-pubertal gonadectomy on skeletal growth showed that, rather than being 'stunted,' the growth period and radial/ulnar length was in fact, extended, resulting in the animals being slightly taller, determined using radiographs, than animals neutered at the traditional age [47].

Concerning obesity, the same study showed that the proportion of overweight dogs was actually lowest in the early aged gonadectomised group, as opposed to the traditional aged dog group.

The anaesthesia of very young puppies requires extra care to prevent hypoglycaemia and hypothermia. The use of modern and safe anaesthetic agents is imperative. If these principles are observed, there is no increased risk of surgical or anaesthetic complications [48].

Consistent with the findings of Spain et al., (2004), Thrusfield et al., 1998 reported a twofold increase in risk of urinary incontinence in females neutered early. In contrast, [49] and others found no evidence that suggests that the incidence of urinary sphincter incompetence which leads to urinary incontinence is higher in bitches which were spayed at an earlier age. More research is required before a convincing recommendation can be made regarding USI and age of gonadectomy. However, considering that those that did find a correlation, was associated only with early age gonadectomy (6–12 weeks of age), it may be safer to recommend that female puppies (of particular at risk breeds), not undergo OVH or OVE until the age of 3–5 months.

Although there are no reports investigating whether gonadectomy affects incidence of canine hip dysplasia (HD), it has been reported that the age of neutering may affect the incidence of HD. It was shown that in dogs gonadectomised before 5.5 months of age, 6.7% developed hip dysplasia, whereas among those gonadectomised at ≥ 5.5 months of age, 4.7% developed the condition [12] (n = 1842).

The vulvas of puppies neutered prior to puberty appear smaller when compared to intact bitches. Peri-vulvar dermatitis has been associated with weight gain and

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recessed vulvas following ovariohysterectomy, there is no information to suggest that the occurrence is higher in bitches spayed at early ages over those neutered at traditional ages [12].

The perception that male cats are predisposed to obstructive lower urinary tract disease by neutering is not borne out by the scientific evidence. In a retrospective survey, cats castrated at an early age, had no greater incidence of obstructive urinary tract disease than did cats castrated at traditional ages [50].

Behaviour appears not to be influenced by early age gonadectomy as dogs and cats showed no difference in urinary or aggressive behaviours. Dogs neutered pre-pubertally have a higher success rate in becoming guide dogs [48].

Hysterectomy, hemi-ovariohysterectomy and ovarian tissue transplant

Because of the disadvantages of gonadectomy, numerous workers experimented with only removing the uterus (hysterectomy) and part removal of the gonads (partial spay) in order to prevent or ameliorate the many adverse effects of gonadectomy yet rendering the bitches infertile.

Hemi-ovariohysterectomy, also known as partial spay, refers to removal of one ovary and usually the entire uterus [51] whereas the ovarian tissue transplant refers to complete ovariohysterectomy followed by re-implantation of ovarian tissue beneath the stomach serosa or spleen. All these procedures involve leaving one or both ovaries or remnant ovarian tissue (ROT) which in turn leaves potential for oestrogen production and may lead to authentic signs of oestrous and pseudopregnancy [52;53]. Whilst some pet owners would be happy to live with these symptoms in order to avoid the adverse effects of gonadectomy, there are serious health risks to consider with ROT. These undisputedly include mammary tumours and although more research is required with larger sample sizes, there appears to be increased risk for granulosa cell tumours [54], cystic ovarian disease and other reproductive tumours [55;56] and diabetes [23]. Neutering procedures that leave ROT are therefore ethically questionable. However, there might be owners of predisposed breeds that might be more concerned about the risk for urinary incontinence, osteosarcoma or other tumours associated with gonadectomy and for these owners leaving ROT may be an option. For these owners of such pets, an individual risk benefit assessment of all the factors involved should be undertaken and discussed with the owner's veterinary surgeon.

Partial spaying procedures performing unilateral salpingectomy may be of use in wild or captive bred populations where reduced fecundity is desired in preference to sterility without disturbing the dynamics of the population (e.g. lion pride). It is important to

note that hemi-ovariectomy may not have the same effect due to potential development of compensatory ovulation by the contra-lateral ovary

Alternatives to gonadectomy

When an animal may be intended for future breeding, when owners are averse to putting their pet through the required surgery or when an animal is a high risk for surgery, effective pharmacological contraceptive alternatives are possible. For the purposes of this discussion, contraception will be defined as a reversible method for blocking fertility [13]. These methods include chemical castration, oestrus prevention, oestrus suppression, pregnancy prevention and termination [57].

Suppression or prevention of oestrus can be achieved through progestins, androgens, GnRH agonists, and GnRH antagonists. Although progestins have been used for many decades for this purpose, there is now considerable evidence that the use of progestins is associated with a high incidence of pyometra, obesity, mammary hyperplasia or neoplasia, fibroadenomatosis and diabetes mellitus [58-61]. In addition, if progestins are administered during pregnancy, they may result in masculinization of female foetuses and may interfere with parturition [29]. Androgens also have a variety of unwanted side effects.

In terms of chemical castration, various products are available, although none are currently licenced in South Africa. The progestin, Delmadinone acetate (Tardak®) is registered in certain countries to control hypersexuality, the treatment of prostatic pathology and peri-anal tumours and aggression. Sterilization by means of permanent testicular damage induced by intra-testicular injection of various solutions is currently receiving a lot of attention in other countries, especially for animal shelters and areas which do not have access to surgical facilities. Current products on the market contain zinc gluconate solutions (Testoblock™, Neutersol®) which are thought to cause a reaction similar to an auto-immune orchitis [62], causing irreversible sterility.

Although currently not locally available, GnRH agonists (analogues) in the form of subcutaneous implants or depot injections (Gonazon™, Suprelorin®, Biorelease deslorelin) hold great promise for oestrus prevention and suppression in bitches as well reducing circulating testosterone in males therefore causing reversible spermatogenic arrest and the reduction or abolition of testosterone-dependent traits such as libido and urine marking [63]. Their main disadvantage is that they may cause an initial induction of oestrus or "flare-up" in anoestrus bitches, 1-4 weeks after the start of the treatment [64;65]. The somewhat unpredictable duration of effect and return to oestrus may also be of concern in breeding bitches. GnRH agonists are popular where they are available because they result in entirely reversible chemical sterilization in

both males and females with minimal side effects. A novel approach to controlling reproductive function is the concept of immune-sterilization or immune-contraception. This involves the production of vaccines that target reproductive hormones, gamete antigens or the conceptus as an antigen. Depending on the target, the outcome is either suppression of sexual function or of conception. Where overall suppression of sexual function is desired the most successful target for immune-contraception is the hormone, GnRH [5]. Work has been done in wildlife and cervids in particular using Gonacon™ a GnRH-keyhole limpet haemocyanin [5]. Where contraception alone is required, work has been done in elephants and horses using a porcine zona pellucida (PZP) vaccine which targets the oocyte [66]. Research into the development of a new GnRH Rabies-linked vaccine for permanent immunosterilization is ongoing. This would provide the potential for both population control and protection against this important zoonotic disease [67] but would still be at risk for uterine disease and neoplasia as discussed before.

Summary of recommendations regarding gonadectomy

1. Method of sterilisation

Once the decision has been made to permanently sterilise the pet, surgical sterilisation is recommended. This can be done by conventional surgical methods or by laparoscopic surgery. If pre-pubertal sterilisation is practised, ovariectomy should be recommended rather than is ovariectomy.

2. Age of sterilisation

In dogs and cats, male and female, pre-pubertal gonadectomy (3–5 months) has advantages over both gonadectomy at early ages (6–12 weeks) and traditional ages (6–12 months).

3. Male cats and female cats

All cats not intended for breeding should be sterilised as soon as they have completed their primary vaccinations but not later than 5 months of age. This is recommended because there is no evidence of adverse effects of early gonadectomy in cats and the risk of unwanted pregnancies is far greater in cats than in dogs due to the difficulties involved in confining cats.

4. Male dogs

For most owners, the benefits of castration will outweigh the possible disadvantages. However, many dog owners may elect not to castrate their male dog. These owners will assess the individual risk profile of their dogs and discuss with their veterinarian the implications of castration when and if medical or behavioural problems arise. Veterinary surgeons should respect this scientifically sound view.

5. Bitches

Overall, it appears justified to recommend spaying all females not intended for breeding, because the procedure is more likely to prevent rather than cause disease. Therefore, for most owners and most breeds, despite the many possible adverse effects of spaying in bitches, the benefits will outweigh the possible disadvantages. This is due to the fact that most owners cannot guarantee that they will be able to prevent an unwanted pregnancy in their bitch and are not willing to put up with the nuisance of the bitch being "on heat". However, for some owners, the recommendation must be made on an individual case-by-case basis, after evaluating the breed of the dog, the lifestyle of the owner and dog itself. In all cases it might be prudent to include some of the more common adverse effects (particularly USI) in the standard written consent form for surgery. This allows the owner of the pet to make an informed

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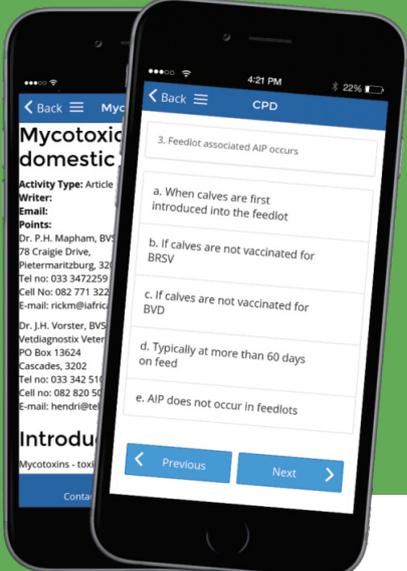


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decision following discussion of the risks and benefits of gonadectomy with their veterinary surgeon.

Conclusion

For most owners and most pets, early gonadectomy is the most appropriate recommendation. However, there are studies that indicate that there may be a very slight increase in certain neoplastic conditions (osteosarcoma, haemangiosarcoma) as well as cranial cruciate ligament rupture. It is important to note that these adverse effects are in many cases affected by breed, age of sterilization and gender. Finally it is important for veterinary surgeons to interpret the results of such studies with circumspection. It would be wrong to interpret the results as saying that sterilization causes neoplasia. A slight increase in a specific neoplasia and a specific breed may be a more appropriate interpretation. Ovariectomy and prepubertal gonadectomy both make sound scientific sense. Laparoscopic surgery in competent hands is less invasive results in quicker recovery and certainly shows potential for the future.

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CPD Questions

AC/1288/14



Question 1

Which of (a-e) is the correct answer to the following statement.

The medical benefits of gonadectomy in the bitch includes.....:

- a) Less aggression towards other bitches
- b) Decreased risk of mammary neoplasia if sterilised after 2nd oestrus cycle
- c) Decreased risk of mammary neoplasia if sterilised before 2nd oestrus cycle
- d) Increased basal metabolism
- e) Decreased risk of perianal adenoma

Question 2

Castration has numerous advantages in the male dog. Which of the following statements is FALSE.

- a) castration of the male dog controls urine marking
- b) castration of the male dog reduces the tendency to roam
- c) castration of the male dog reduces aggression
- d) castration of the male dog reduces the risk for benign prostatic hyperplasia
- e) castration of the male dog reduces the risk for perianal adenoma

Question 3

Sterilisation of male dogs increases the risk of certain conditions. Select the statement which is FALSE.

- a) Sterilisation in male dogs increases the risk of haemangiosarcoma
- b) Sterilisation in male dogs increases the risk of perianal adenoma
- c) Sterilisation in male dogs increases the risk of cranial cruciate ligament rupture
- d) Sterilisation in male dogs increases the risk of prostatic neoplasia
- e) Sterilisation in male dogs increases the risk of osteosarcoma

Question 4

Which of the following statements is true for sterilised tomcats .

- a. The incidence of urethral obstruction is increased when sterilised, irrespective of at what age it is performed
- b. The incidence of urethral obstruction is increased when tomcats are gonadectomised pre-pubertal
- c. Gonadectomised cats have similar incidence of urethral obstruction than intact cats
- d. Gonadectomised cats have a decreased risk of urethral obstruction than intact cats
- e. None of the above

Question 5

Which of the following statement is TRUE with regards to hemi- ovariectomised dogs

- a) hemi- ovariectomised dogs are at increased risk of ovarian neoplasia
- b) hemi- ovariectomised dogs do not come into season
- c) hemi- ovariectomised dogs may still produce litters albeit smaller litters
- d) hemi- ovariectomised dogs is the only procedure performed in Scandinavia
- e) none of the above

Question 6

Which of the following statements is true with regards to alternatives to surgical sterilisation.

- a) Immuno-contraception is currently the most used alternative to contraception in small animal practice
- b) Progestogens should not be overlooked and should be considered first choice
- c) Intra-testicular injection of zinc gluconate solutions causes reversible sterility
- d) GnRH analogues hold the most promise
- e) All of the above

Question 7

Which of the following statements relating to ovariectomy before the second oestrus cycle is FALSE

- a) Complete ovariectomy before the second oestrus cycle in the bitch eliminates the risk of pyometra
- b) Complete ovariectomy before the second oestrus cycle in the bitch decreases the risk of mammary neoplasia
- c) Complete ovariectomy before the second oestrus cycle in the bitch decreases the risk of urethral sphincter incompetence
- d) Complete pre-pubertal ovariectomy before the second oestrus cycle in the bitch increases the risk of weight gain
- e) None of the above