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## Ovariectomy versus ovariohysterectomy. Is the eternal argument ended?

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Gonadectomy is one of the most frequently performed surgical techniques in veterinary practice because it is the most reliable means of pet population control. The importance of pet population control is underscored by the American Humane Association's Animal Shelter Reporting Study that between 3.9 and 5.9 million dogs are euthanatized annually in the United States. Gonadectomy can be performed by ovariectomy (OVE) or ovariohysterectomy (OVH), the latter being the preferred approach in the USA. This preference is most likely based on the presumption that future uterine pathology is prevented by removing the uterus. In the Netherlands and some other European countries, OVE is routinely performed and has replaced OVH as the standard approach for gonadectomy; the uterus is only removed when uterine pathology is present.

### SURGICAL TECHNIQUE

OVE is started by a median coeliotomy extending from the umbilicus to approximately halfway between umbilicus and os pubis, depending on dog size. In deep-chested or obese dogs it is sometimes necessary to enlarge the incision cranially to allow sufficient exposure of the ovarian pedicle. The ovary is located, and retracted caudally to expose the suspensory ligament and ovarian pedicle. The suspensory ligament is stretched, broken, or transected by electrocoagulation or scissors, to improve manipulation and observation of the pedicle. The arteriovenous complex within the pedicle, arising from the ovarian artery and vein is ligated with 0 - 4/0 absorbable suture material, depending on pedicle size, after which it is transected. The uterine artery and vein are ligated at the cranial tip of the uterine horn, 5 mm caudal to the proper ligament, using 2/0 - 4/0 absorbable suture material, and transected at the proper ligament. After excision the ovarian bursa is opened and inspected to confirm complete ovarian removal.

OVH is also performed through a median coeliotomy, although, based on the dog's size and body condition, the incision is lengthened in a caudal direction. After the ovarian pedicles are ligated and severed, the broad ligament is examined. If it is vascular, it is ligated with 1 or 2 ligatures using 2/0 - 4/0 absorbable suture material before it is cut or torn. A clamp is placed on the uterine body just cranial to, or on, the cervix. The uterine arteries are individually ligated proximal to the clamp using 2/0 - 4/0 absorbable suture material and the uterus is ligated circumferentially in the

crushing groove that remains after removal of the clamp using 0 - 4/0 absorbable suture material. After inspection for potential bleeding at the ligated pedicles, the coeliotomy is closed in layers.

### OVE VERSUS OVH

From a technical perspective, OVE is less invasive and less time-consuming than OVH. Although it is possible to perform OVH through a small median coeliotomy, atraumatic technique and correct placement of the uterine ligature near the cervix typically requires a larger coeliotomy compared with OVE. Thus, the duration of surgery and anesthesia should be shorter for OVE, and because the coeliotomy is shorter, the broad ligaments are not disrupted, and the uterine stump left intact, there should also be less surgical trauma.

The primary rationale for selection of OVH or OVE is likely related to the expected frequency of short- and long-term complications. In a retrospective study of 62 dogs that had OVH, 17.7% developed complications. Complications associated with OVE would be expected to be similar to complications associated with the ovariectomy component of OVH, however other complications associated with removal of the uterus in OVH would not be expected with OVE. A review of reported complications after OVE and OVH is presented below and a logical decision for technique is suggested.

### Intra-abdominal haemorrhage

Haemorrhage was the most common complication (79%) in dogs > 25 kg in a review of 853 OVHs. Concurrently, haemorrhage has been determined to be the most common cause of death after OVH in large breed dogs. Clinically important haemorrhage primarily occurs from the ovarian pedicles, the uterine vessels, or the uterine wall when ligatures are improperly placed, and rarely occurs from vessels that accompany the suspensory ligament or within the broad ligament. Thus, comparing OVE and OVH, the likelihood of clinically important haemorrhage from the ovarian pedicles should be similar. Theoretically, OVH has additional risk for haemorrhage from vessels in the broad ligament and from uterine vessels near the cervix (where the uterine arteries are larger than at the tip of the uterine horn and bleeding can be

more severe in comparison). Haemorrhage from uterine vessel rupture caused by excessive traction on the uterine body during OVH has been reported.

## Vaginal bleeding

Single nonabsorbable multifilament ligatures around the uterine body can predispose to erosion of uterine vessels, resulting in intermittent vaginal bleeding. Pearson reported vaginal bleeding in 11 (15%) of 72 dogs, 4 - 16 days after surgery. Vaginal tamponade or exploratory coeliotomy may be indicated, if the bleeding becomes severe. Vaginal haemorrhage also may be associated with infection caused by contamination during surgery, use of infected suture material, or from transfixation ligatures that enter the lumen of the uterus or cervix.

The advantage of ligating the uterine vessels at the uterine horn tip and transection at the proper ligament is, that the uterine horn is not opened and the serosa remains intact. Bleeding from the vulva in the first weeks after surgery cannot occur. The only case in which one of the authors have observed a dog with vaginal bleeding after ovariectomy was when the surgeon transected the uterine horn (and thus opened the lumen).

## Ligation of the ureter

Direct obstruction of a ureter occurs when the ureter is accidentally included in a ligature. If, for instance, the pedicle is ligated to close to its base at the abdominal wall, because of inadequate exposure of the caudal pole of the kidney, the proximal aspect of the ureter may be incorporated. More often the distal part of the ureter is involved because of its close location to the uterine body. Inadvertent, suture-associated occlusion of the distal ureter is more common if a distended urinary bladder displaces the trigone cranially. Okkens, et al reported complications after OVH in 109 dogs, admitted over a 2-year period (1977-1979) at the University of Utrecht. Of these dogs, 18 had signs related to the urinary system. Direct ligation of the ureter was observed at the ovarian pedicle in 2 dogs (11%) and at the distal ureter by uterine ligature in 3 dogs (17%). It is evident that the chance of ligation of the proximal ureter during OVE is identical to the OVH technique, but distal ureteral ligation is nonexistent during OVE.

## Ovarian remnant syndrome

Recurrent oestrus occurs after OVE or OVH when the ovaries are incompletely removed and residual ovarian tissue becomes functional. Collateral circulation to the ovarian tissue can develop even though the ovarian arteriovenous complex has been ligated and interrupted. In dogs, neither ectopic ovaries (ovarian tissue in an abnormal location such as in the mesentery), nor accessory ovarian tissue extending into the ligament of the ovary have been reported compared with their occurrence in cats, cows, and humans. Pearson

(1973) described 12 dogs with recurrent oestrus in a group of 72 dogs with complications after OVH (17%). Okkens, et al reported 109 dogs with complications after OVH, of which 55 dogs had complications of a gynaecologic nature. Residual ovarian tissue was observed in 47 dogs (43%). Of these dogs, 16 had bilateral, 25 right-sided, and 6 left sided residual ovarian tissue. Ovarian remnants tend to be more commonly located on the right side. This higher frequency of right-sided ovarian remnants has been observed by others and is likely explained by a more cranial and deeper anatomic location of the right ovary, decreasing the ease of observation and removal. When performing OVE, the surgeon is placing 2 cuts close to the ovary (ovarian pedicle and proper ligament). One could argue, but this remains speculative, that there is an increased chance for ovarian remnants with OVE in comparison with OVH (where only 1 cut is made close to the ovary); however this cannot be confirmed by literature review.

Most ovarian remnants occur after OVH. This may be because OVH is more commonly performed technique or because that the coeliotomy for OVH is located more caudally making observation of the (right) ovary more difficult. Decreased visualization enhances the chance for incorrect technique and the chance for ovarian remnants. In OVE, the incision can be positioned more cranial, avoiding this problem. Ovarian remnant syndrome can be avoided by correct surgical technique regardless of technique used. It is essential to have the incision cranial enough to allow complete visualization, especially of the right ovary. To achieve this with OVH a larger incision is necessary than for OVE.

## Stump granuloma

Inflammation and granuloma formation can be caused by ligatures of nonabsorbable suture material, poor aseptic technique, or excessive residual devitalized tissue (at the uterine body). Braided nonabsorbable suture materials, such as silk, nylon, or linen, and non-surgical self-locking nylon bands (cable ties) have been implicated in most patients. Okkens et al reported granulomas at the ovarian pedicle in 1 patient (6%) and at the uterine stump in 5 patients (28%). In dogs with gynaecologic complications after OVH, Okkens et al. observed 8 (15%) stump granuloma. The likelihood for development of a granuloma at the ovarian stump is not influenced by technique (OVE versus OVH), but the incidence of the more common granuloma at the uterine stump cannot occur with OVE. Granulomas at the uterine horn tip are possible, but to our knowledge, have not been described.

## Endometritis and pyometra

Epidemiologic data for ~200,000 dogs covered by insurance in Sweden revealed that ~ 1,800 non-spayed bitches were treated for pyometra in 1996. The risk of an intact bitch developing pyometra before 10 years of age was 23 - 24%. Other studies, albeit on a smaller scale, had similar findings. Fukuda reported a 15.2% chance for the development of pyometra in 15.2% chance female dogs > 4 years old (n =

165) and Von Berky reported a 14.9% chance for uterine disease (n = 175).

Thus, it is important to determine if the uterus in ovariectomized dogs is predisposed to develop endometritis and pyometra. Pyometra has been defined as a hormonally mediated diestral disorder resulting from bacterial interaction with an abnormal uterine endometrial that has undergone pathologic changes assumed to be caused by an exaggerated response to progesterone stimulation. Recently, the concept of considering cystic endometrial hyperplasia (CEH)-pyometra as a complex has been questioned. It has been suggested that 2 different disorders; one where CEH-endometritis appears to have a strong hormonal component and pyometra might be more influenced by the bacterial component. Nevertheless, both conditions are exclusively encountered in the luteal phase of the oestrus cycle. Experimentally CEH or CEH-endometritis can be induced by administration of progesterone, even in ovariectomized bitches. Withdrawal of progesterone treatment causes regression of the naturally occurring disease. Thus exposure to progestagen appears to be necessary for the development of CEH-endometritis.

A study by Okkens et al comparing the long-term effects of OVE versus OVH was conducted at the University of Utrecht in 1997. Questionnaires were sent to 264 owners of bitches that had either OVE (n = 126) or OVH (n = 138) performed for routine neutering 8-11 years earlier. Complete data were obtained for 69 OVE bitches and 66 OVH bitches. None of the OVE bitches had signs consistent with having had endometritis. With the exception of urinary incontinence, no other problems related to surgical neutering were identified. These findings agree with those of Janssens who performed ovariectomy on 72 bitches and after a 6 - 10 year follow-up, no pyometra was detected. When OVE is correctly performed (all ovarian tissue removed) and in the absence of supplementation of exogenous progestagens, endometritis (CEH or pyometra) cannot occur.

These studies strongly suggest that progesterone is an essential factor in the occurrence of CEH-endometritis-pyometra and that correctly performed, OVH or OVE will prevent development CEH-pyometra in later life. OVE will not increase the chance for development of CEH-pyometra compared with OVH.

## Uterine tumor formation

Uterine tumors are rare in the dog, with a reported rate of 0.4% of all canine tumours. The University of Pennsylvania Veterinary Hospital examined 33,570 female dogs between 1952 and 1966, and 96 gynecologic neoplasms (uterus, n=11; vagina or vulva, n=85) were detected in 90 dogs (0.27%). Middle-aged to older animals were most commonly affected and most canine uterine tumours were mesenchymal in origin. Of the uterine tumours, 85-90% were benign leiomyomas and 10% leiomyosarcomas. The true risk for development of malignant tumoural disease of the uterus is 0.003%. The prognosis associated with leiomyomas and other benign tumours is excellent because surgery is nearly always curative. For leiomyosarcomas and other

malignant tumours, the prognosis remains good if there is no evidence of metastatic disease at surgery and complete excision is possible. When performing gonadectomy, the surgeon has to balance the risk for possible tumoural development in the uterus when performing OVE, against the increase in surgery related complications when performing OVH.

## Urinary sphincter mechanism incontinence

Long-term studies have been unable to detect a difference between occurrence of incontinence in dogs after OVE compared with OVH. One of the initial reports concluded that there was no difference between OVE and OVH. Another study reported that 54 out of 260 OVE dogs developed incontinence (20.8%) compared with 29 of 152 OVH dogs (19.1%); however, this difference was not significant.<sup>45</sup> Okkens et al reported urinary incontinence in 15 dogs (11%) after long-term follow-up but no significant difference in incidence between OVE and OVH neutered bitches.

## Body weight gain

No significant difference in weight gain has been observed between dogs that had OVE versus OVH in other studies.

## CONCLUSION

The absence of randomized studies comparing complications after OVE and OVH in dogs forces us to interpret historical reviews of both techniques. The rational conclusion after review, when immediate postoperative complications are considered, is that either technique can be used for canine female gonadectomy. The surgeon has to choose the least invasive, fastest, and safest procedure. A major advantage of OVE is that it can be performed through a smaller coeliotomy and with less traction on the female genital tract. Technically, OVH is more complicated (more tissue is ligated and transected), time consuming (because a larger coeliotomy is needed to expose the entire uterus) and is therefore expected to be associated with a greater short-term morbidity when compared with OVE. However, differences in short-term postoperative morbidity between the 2 techniques have not been published. Increased risk for surgery-related complications associated with OVH are estimated for: intra-abdominal and vaginal bleeding (because of larger vessel diameter near the uterine body), ureteral ligation (because of close proximity of the distal part of the ureter to the uterine body), ovarian remnants (because of the more caudally located incision), uterine stump complications, and sinus tracts (because of mucosal exposure).

Since 1981, after introduction of OVE as the standard technique for canine neutering at Utrecht University, no increase in short-term complications has been observed. With respect to long-term urogenital problems, including endometritis/pyometra and urinary incontinence, it has been

clearly established that they do not any occur more frequently with either technique. The overall chance for development of uterine tumours is very low (0.003%), and, in our opinion, does not warrant performing a potentially more traumatizing surgical procedure, OVH, that might be associated with more postoperative complications.

Without benefit of more prospective studies comparing surgical complications between OVE and OVH, most evidence extracted from the literature leads us to the conclusion that there is no benefit and thus no indication for removing the uterus during routine neutering in healthy bitches. Thus we believe that OVE should be the procedure of choice for canine gonadectomy.

## Reference

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