Ovariectomy vs ovariohysterectomy: should the uterus stay or should it go?
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Objectives
- To discuss the pros and cons for ovariohysterectomy (OVH) and ovariectomy (OVE) procedures.
- To review the short-term and long-term complications associated with each procedure.
- To provide an evidence-based approach for making the decision of performing either an OVE or an OVH.

Key points
- From a technical perspective, the OVE is less invasive and less time consuming than the OVH procedure.
- Complications associated with the OVE procedure would be similar to those associated with the ovariectomy portion of the OVH procedure. However other complications associated with removal of the uterus in an OVH would not be expected with an OVE.
- The uterus should always be removed if there is evidence of uterine pathology.
- Complete removal of the ovaries prevents the occurrence of pyometra. In order to develop cystic endometrial hyperplasia-pyometra complex, progesterone must be present either from the ovary at the luteal phase of the estrous cycle or from an exogenous source. Post-gonadectomy endogenous progesterone occurs from ovarian remnant syndrome.

Overview
There has been a long lasting argument regarding whether or not the uterus should be removed during gonadectomy in female patients. In the USA, the preferred method is performing OVH, whereas in most European countries, the OVE is the preferred method. In the USA, there has been a recent greater push to switch to the OVE procedure; however, much resistance is still present. So why is that? With a quick search of the Veterinary Information Network, you can quickly determine the strong feelings present for one procedure versus the other. Some are founded on experience, and some are founded on misinformation. In most veterinary educational programs in the USA, the OVH procedure is taught primarily. Most recently, with the increased use of minimally invasive surgical techniques, laparoscopic OVE has gained popularity, bringing up the discussion once again.

At this time there are few randomized studies comparing complications after OVE and OVH. Based on the evidence that is currently available in the veterinary literature, there is no support for any benefit and therefore no indication for removing the uterus during routine neutering of healthy bitches.

Surgical technique
From a technical perspective, OVE is an easier, less invasive surgery when compared to OVH. Both require a median celiotomy, however for the OVE the incision is smaller and located more cranial, at the level of the umbilicus. This allows for better exposure of both ovaries. In the OVH, the incision is extended caudally towards the pubis, to allow ligation of the uterine body cranial to the cervix. The identification and exposure of the ovary is performed similarly for both procedures. However, due to the OVH requiring a longer incision caudally, most veterinarians do not extend the incision cranially enough to allow for adequate exposure of both ovaries. Presumably this is done because the ovary can be exteriorized after the suspensory ligament is broken, whereas the uterus is more fixed. As well, most surgeons want to make a small approach for the procedure, expediting closure and decreasing postoperative pain. The more caudal incision does make access to the right ovary, which is positioned more cranially, more challenging. Although it is possible to perform an OVH through a small incision, atraumatic technique and correct placement of the uterine ligatures near the cervix requires a longer
celiotomy. In the OVE, because the celiotomy is shorter and because the broad ligaments and uterus are not disrupted, there should be less surgical trauma.

In one study from Utrecht University (Peeters, 2011), there was no significant difference in the total surgical time, pain scores, and wound scores between OVE and OVH. In this study, all surgeries were performed by a board certified surgeon. There may be some differences between a new graduate performing these procedures. However, with time and experience, the time difference should diminish.

**Postoperative pain**

Pain following either OVE or OVH was evaluated in a prospective clinical trial (Peeters, 2011). There was no significant difference in Glasgow composite measure pain scale between groups, and rescue analgesia was not required for any dog. All dogs in this study received carprofen prior to and following surgery, as well as buprenorphine for the first 24 hours postoperatively. With either procedure, the use of good preemptive and postoperative analgesia should minimize any difference between surgical procedures.

**Postoperative complications**

The primary rationale for selection either OVE or OVH is often related to the frequency of short-term and long-term complications. In a retrospective study of 62 dogs that had OVH, 17.7% developed complications. Most complications are minimal, consisting of incisional inflammation and gastrointestinal upset, however more severe complications such as intra-abdominal hemorrhage, vaginal bleeding, ureter ligation, granuloma formation, and ovarian remnant syndrome can occur with high frequency.

**Short term complications**

*Intra-abdominal hemorrhage.* Life threatening hemorrhage can develop with either procedure and may occur from the ovarian or uterine pedicles, and the broad ligaments. In OVH surgery, the frequency of hemorrhage is greater in dogs weighing >22.7 kg and in procedures performed by inexperienced surgeons. The frequency of hemorrhage is reported between 6.4% and 20% of dogs. Bleeding was most often reported from the right ovarian pedicle. Hemorrhage was determined to be the most common cause of death after OVH in large breed dogs. Unfortunately the incidence of hemorrhage following OVE has not been reported. However, Peeters (2011) reported no significant difference in surgical blood loss between both procedures during surgery, when performed by an experienced surgeon. In this study the suspensory ligament was also coagulated prior to transection. In another study evaluating OVH at a teaching institution (Berzon, 1979), 9% of dogs developed intraoperative or postoperative hemorrhage. Thus, comparing OVE and OVH, one can presume that the likelihood of hemorrhage from the ovarian pedicle should be similar. In theory, there is additional risk with the OVH of bleeding from the broad ligament and uterine vasculature. Surgical experience and surgical approach are significant factors impacting risk of intra-abdominal hemorrhage.

*Vaginal bleeding.* Vaginal bleeding has been reported to occur in up to 15% of patients undergoing OVH. Causes for vaginal bleeding include the placement of transfixation ligatures and erosion of the uterine vessels from non-absorbable multifilament ligatures. This complication would not be expected in OVE patients. However, transaction of the uterine horn during OVE could cause vaginal bleeding, so care should be taken during ligation of the uterine horn tip vasculature and during transection at the proper ligament.

*Ligation of the ureter.* Although ligation of the ureters during either procedure is uncommon, the complications can be severe. Ligation can occur proximally during ligation of the ovarian pedicle if the ligature is placed deep at the base of the abdominal wall. If exposure is inadequate the caudal pole of the kidney may not be visible and the proximal ureter can be incorporated. More commonly, ligation of the distal ureter occurs during placement of the uterine body ligature. This occurs more commonly if the
urinary bladder is distended and the trigone is therefore displaced more cranially. One report from the University of Utrecht reported direct ligation of the ureter at the ovarian pedicle in 11% of dogs and ligation of the distal ureter at the uterine ligature in 17% of dogs. Therefore the chances of ligation of the ureter should be similar at the ovarian pedicle between both procedures. The risk of distal ureter ligation is only a factor for the OVH.

**Ovarian remnant syndrome.** Ovarian remnant syndrome is a disorder characterized by the development of functional residual ovarian tissue after OVH or OVE. Recurrent estrus and development of pyometra can be seen in these patients. This occurs due to incomplete removal of the ovary usually during transaction of the pedicle. Any small remaining remnant of ovarian tissue can re-vascularize and become functional again. There currently are no reports of ectopic ovarian tissue in dogs, therefore this syndrome is considered to be directly related to remaining functional ovarian tissue after surgery.

Recurrence of estrus following OVH has been reported in 17-43% of dogs. Ovarian remnants appeared to occur more commonly on the right side. The increased occurrence on the right side is likely explained by the more cranial location of the right ovary, incisions not extending cranially enough, and therefore decreased visibility of the ovary and ligature placement. However, it has been suggested that the occurrence of ovarian remnant syndrome would be decreased with OVE because of the more cranial location of the incision, allowing greater exposure. One could also argue that during the OVE, due to making two cuts close to the ovary (pedicle and proper ligament) there is a higher chance of inadvertently leaving ovarian tissue. Unfortunately there currently are no studies evaluating the incidence of ovarian remnant syndrome in dogs undergoing OVH versus OVE. Ovarian remnant syndrome can be avoided with either surgery by proper visualization and correct surgical technique.

**Stump granuloma.** Ligatures of non-absorbable suture, poor aseptic technique, and/or large amounts of devitalized tissue can all cause inflammation and granuloma formation. One study (Okkens, 1981) found the incidence of ovarian pedicle granuloma in 6% of patients and at the uterine stump in 28%. Another report by the same author indicated that in patients with gynecologic complications after OVH, granulomas accounted for 15% of complications. Fistulous tracts associated with the granulomas occurred in 38% of dogs with granuloma formation. Suture associated granulomas can be prevented by using synthetic absorbable materials. Both OVE and OVH can result in the formation of granulomas from the ovarian stump, but only the OVH has the additional risk of for uterine stump granuloma formation.

**Long-term complications**

**Endometritis and pyometra.** Pyometra is defined as a hormonally mediated disorder in diestrus, resulting from interaction of bacteria and an endometrium that has undergone pathologic changes because of an exaggerated response to progesterone stimulation. Both cystic endometrial hyperplasia and pyometra are only seen in the presence of progesterone. This most commonly occurs during the luteal phase of the estrus cycle but can be induced by administration of exogenous progesterone. In one study from the University of Utrecht (Okkens, 1997), comparing the long-term effects of OVE versus OVH, none of the dogs had signs associated with endometritis or pyometra. In another study, also from the University of Utrecht, it was found that in dogs with gynecologic complications, 35% had stump pyometras, all of which had residual ovarian tissue. In that same study, there were 47 bitches that had histologic evidence of cystic endometrial hyperplasia, and all had residual ovarian tissue as well. When either OVH or OVE is correctly performed and all ovarian tissue is removed, and without exogenous progesterone, cystic endometrial hyperplasia or pyometra cannot occur.

**Uterine tumor formation.** The incidence of uterine tumors in the dog is reported as 0.4% of all canine tumors. Another study from the University of Pennsylvania found the incidence to be 0.03%. Among uterine tumors, 85-90% are benign leiomyomas and 10% are leiomyosarcomas. The risk for development of a malignant tumor in the uterus is calculated at 0.003%. The prognosis with leiomyomas
is excellent with complete resection. For leiomyosarcomas the prognosis is good with complete resection as long as there is no evidence of metastatic disease. To date there are no reports of uterine neoplasia in a dog that has had its ovaries removed prior to two years of age. This may suggest a hormonal influence in the development of these tumors. When deciding whether to perform OVE versus OVH, the surgeon must balance the risk for possible development of a tumor versus the development of surgical related complications from the procedure.

Mammary tumor formation. Mammary gland tumors are the most common tumors in female dogs, with a 3.4% incidence. Of these, 41-53% are reported to be malignant. The relative risk for malignant mammary gland tumor occurrence in dogs spayed before the first estrus is 0.5%. The relative risk increases to 8% between the first and second estrus, and 26% between the second and third estrus. Sterilization by either OVE or OVH before the first estrus will largely eliminate the risk of mammary tumor development in dogs.

Urinary sphincter mechanism incompetence. The occurrence of urethral sphincter mechanism incompetence (USMI) post-gonadectomy is the most common cause of urinary incontinence in spayed dogs. This has been reported to occur in 3-20% of spayed bitches an in only 0.2-0.3% of intact bitches. There is a large hormonal component to development of USMI, however the exact cause of USMI has not been completely identified and is likely multifactorial. Long-term studies have not detected any difference in the occurrence of incontinence between OVE and OVH dogs. Individual studies report an incidence of USMI ranging from 9-21% with OVE and 14-20% with OVH.

Conclusion

Based on studies reported in the veterinary literature, and the unfortunately few prospective randomized studies, there is no strong scientific evidence for removal of the uterus during sterilization of the female dog. Ovariecctomy provides an equally effective technique for sterilization in the dog and cat with no reported disadvantages. Since 1981, OVE has been the standard technique for sterilization of bitches at the University of Utrecht. No increases in short-term or long-term complications have been observed. The development of cystic endometrial hyperplasia and pyometra cannot occur if the ovaries are completely removed, and any occurrence of either is indicative of an ovarian remnant. The chances of malignant uterine tumor development is very low, at 0.003%, and therefore may not warrant the additional trauma of removal of the uterus. Potential advantages of the OVE include smaller incisions, better visualization of the ovarian pedicles, and the decreased risk of complications associated with decreased manipulation of the uterus. These advantages of OVE are magnified with the more novice surgeon.

Selected references