



## UNIVERSITY OF CALGARY FACULTY OF VETERINARY MEDICINE

*This review accompanies the relevant episode of the Cutting Edge veterinary podcast. In each episode of this podcast, 3rd year students in the University of Calgary's veterinary medicine program fill you in on the most up-to-date literature and evidence-based practices on topics that matter to you, the practising veterinarian.*

# Differences in Ovariohysterectomy Versus Ovariectomy Procedural Outcomes in Dogs

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We will compare the perioperative and postoperative outcomes associated with open ovariectomy and ovariohysterectomy sterilization procedures in dogs. The question we aim to address is: Are open ovariectomy (OVE) procedures associated with better perioperative and postoperative outcomes than open ovariohysterectomy (OVH) procedures in healthy female dogs? This review looks at several perioperative and postoperative outcomes to determine which of the two, OVE or OVH, should be the procedure of choice. We will discuss the differences in terms of surgical duration, incision length, intraoperative and postoperative pain, and surgical and post-surgical complications such as intra-abdominal hemorrhage and urogenital complications. We want to disclose these differences to help guide best practices for practitioners and veterinary educators.

### **General Information:**

OVE and OVH are both acceptable common practice sterilization procedures for female dogs. OVH procedures are much more common in North America, while OVE procedures are standard practice in Europe.<sup>1</sup> OVH procedures involve the removal of both ovaries and the uterus. While OVE procedures remove the ovaries only, leaving the uterus intact. Both procedures require breaking the suspensory ligament and ligating ovarian pedicles.<sup>1</sup> As long as all ovarian tissue is removed, there is often no indication for removing the uterus in routine sterilization of female dogs.<sup>2,3</sup> These procedures can be used as a means of sterilization but they can also be indicated as therapeutic treatments for ovarian tumors, to prevent vaginal hyperplasia and hormonal changes, and decrease the incidence of mammary gland tumors.<sup>2</sup> It has been suggested that OVE is the preferred sterilization procedure for female dogs because it is proposed to be less technically complicated, less time consuming, and less invasive.<sup>4,5,6</sup> It is also suggested that OVE procedures are associated with less intraoperative trauma, morbidity, and peri and postoperative complications.<sup>4,5,6</sup>

### **Surgical and Anesthetic Duration:**

OVE is less invasive and should be less time-consuming than OVH because there are fewer structures to ligate. Although it is possible to perform OVH through a small median incision, atraumatic technique and correct uterine ligature placement near the cervix typically requires a larger incision compared with OVE, which takes longer to suture closed. Thus, the duration of surgery and anesthesia should be shorter for OVE.<sup>2</sup> There were two studies that found significantly shorter duration of surgery for OVE than for OVH.<sup>6,7</sup> However, other studies found no significant difference in surgical time between the procedures.<sup>5,8</sup> In one of these studies<sup>5</sup>, an OVH technique involving electrosurgery was used and the broad ligaments were not ligated. This may have decreased surgical time since there were only three major ligations as opposed to four in the OVE. Harris et al.<sup>8</sup> also found no significant difference in surgical times between OVE and OVH, even when completed by inexperienced surgeons (fourth year veterinary students). This somewhat unexpected finding may be explained by the difficulties students encountered with locating the ovaries and securing ovarian ligatures.

### **Incision length:**

All studies reviewed found that the length of midline celiotomy incisions through the skin and fascia were shorter for OVE versus OVH procedures.<sup>1,2,4,5,6,7,8</sup> OVE incisions were also more cranial.<sup>1,8</sup> OVH often requires a large incision compared to OVE to aid in atraumatic technique and placement of uterine ligature near the cervix.<sup>7</sup> However, larger incisions create a larger wound surface.<sup>2,7,4,5</sup> Larger incisions aid in visualization and may result in more tissue being traumatized from more traction on the viscera.<sup>2,7,4,5</sup> Surgical duration is often influenced by incision length due to time spent closing these incisions.<sup>8</sup> Thus often the larger the incision, the longer it takes to close.<sup>8</sup> However, prolonged surgical time can be negated by experienced surgeons with skillful suturing.<sup>8</sup> Although incision length may impact surgical duration, studies have found no differences in total surgical time between OVE and OVH procedures.<sup>5</sup> Ultimately incision length is an unlikely parameter to influence the procedure which a surgeon chooses.<sup>8</sup>

### **Peri and Postoperative pain:**

Several studies have investigated the differences between peri and postoperative pain between OVE and OVH procedures. The studies reviewed found no differences in perioperative pain between the two procedures.<sup>1,4,5,6</sup> Tallant et al.<sup>6</sup> found no significant differences of intraoperative nociception indices, such as mean arterial blood pressure and heart rate, in OVH versus OVE patients. To measure postoperative pain, studies have used the validated short and long Glasgow Composite Measure Pain Scales to evaluate patient comfort.<sup>1,4,5,6,7</sup> The majority of published studies found no significant difference in post-operative pain between the two procedures.<sup>1,4,5,6</sup> This may suggest that differences in patient discomfort may be too subtle for the pain scales to appreciate or that there are truly no differences in postoperative pain between the two procedures.<sup>6</sup> It is notable that Lee et al.<sup>7</sup> found significantly lower postoperative pain scores, blood glucose associated with stress, and creatinine kinase levels from muscle trauma, in dogs that underwent OVE procedures compared to those that

underwent OVH. Lee et al.<sup>7</sup> hypothesized that pain scores were higher in postoperative OVH patients due to longer surgical times and incision lengths. Further research must be done to determine if there is a significant difference in peri and postoperative pain between these two procedures. It is also important to note that different anesthetic and analgesia protocols for these procedures and research studies may influence and/or mask the differences in patient discomfort between these procedures.<sup>1</sup>

### **Surgical and Post-surgical Complications:**

Retrospective studies have shown that there are no significant differences in the complication rates between OVH versus OVE procedures in dogs.<sup>5,6</sup> However it is proposed that OVH procedures are potentially associated with greater short term morbidities, such as ureteral ligation, ovarian remnants, uterine stump complications, and intra-abdominal and vaginal bleeding.<sup>2</sup> Potential complications will be explained in further detail below.

### **Hemorrhage:**

DeTora & McCarthy<sup>1</sup> hypothesized there may be less risk of bleeding with OVE because the ovarian pedicles are the only source of blood loss. The benefit of ligating uterine vessels at the uterine horn tip and transecting at the proper ligament, is the uterine horn is not opened leaving the uterine horns intact.<sup>2</sup> Van Goethem et al.<sup>2</sup> postulated a higher morbidity for OVH due to intra-abdominal bleeding and vaginal bleeding. With OVH, there is increased risk of hemorrhage from vessels in the broad ligament and from uterine vessels near the cervix. Uterine arteries are larger here than at the tip of the uterine horn, therefore bleeding could be more severe. Hemorrhage from uterine vessel rupture due to excessive traction on the uterine body has also been reported. However, Peeters and Kirpensteijn<sup>5</sup> compared relative blood loss in dogs undergoing OVH and OVE, and found no difference in relative blood loss between the two procedures.

### **Risk of ureter ligation:**

Ligation of a ureter is a potential complication of spaying procedures. Although this can occur anywhere along the length of the ureter, it is hypothesized to be most common at the distal part of the ureter due to its close proximity to the uterine body.<sup>2</sup> A study by Okkens et al.<sup>9</sup> found that of 109 dogs that underwent elective OVH, 18 were found to have urinary problems after; two dogs (11%) had a ureter ligated at the ovarian pedicle, and three dogs had the ureter ligated at the uterine ligature (17%). Another retrospective study that looked at outcomes of ureter injuries in OVH procedures performed between January 2010 and July 2018 at Queen Mother Hospital for Animals.<sup>10</sup> They found that of the five dogs that had ureter ligated, three had bilateral distal ureter ligation at the uterine stump and two had unilateral proximal ligation at the ovarian pedicle.<sup>10</sup> By performing OVE, there is no risk of ureter ligation at the uterine pedicle and therefore should decrease the overall risk of ureter ligation. However, proximal ureter ligation is still a risk for both procedures. Since this is a rare complication overall, it is difficult to find a statistically significant sample size to prove this theory.<sup>2</sup>

### **Ovarian Remnants:**

Ovarian remnant syndrome can occur after OVE or OVH when the ovaries are incompletely removed and the residual ovarian tissue becomes functional.<sup>2</sup> Ovarian remnants are more common on the right side.<sup>2,11</sup> This is likely because the right ovary is harder to visualize due to the more cranial and deeper anatomic location in the abdomen, enhancing the chance for incorrect technique.<sup>2,11</sup> It has been proposed that ovarian remnants are less likely to occur with OVE due to the more cranial incision allowing better visualization of the pedicle.<sup>1,2</sup> However, Van Goethem<sup>2</sup> alternatively speculated that ovarian remnants were more likely in OVE procedures because two cuts are being made close to the ovary, instead of one cut in OVH procedures. Of 32 dogs with ovarian remnants, Van Nimwegen<sup>11</sup> reported that 59% had initially undergone OVE, while 31% had initially undergone OVH. Ultimately, ovarian remnants are a result of surgeon error and can result from either technique.<sup>11</sup> There have been no known studies specifically comparing ovarian remnants with OVH vs OVE.

### **Granuloma formation:**

Granuloma formation is a risk of both OVH and OVE. Excessive tissue trauma, using braided nonabsorbable suture, and inadequate aseptic technique are the main risk factors for this complication, not technique (OVH vs OVE).<sup>2</sup> The most common location of granulomas is at the uterine stump, and therefore OVE may have a lower incidence of granuloma formation than OVH.<sup>2,9,12</sup>

### **Hormone Responsive Urinary incontinence:**

Hormone responsive urinary incontinence affects 4.9-20% of spayed female dogs. It is associated with decreased estrogen levels after ovary removal, leading to loss of tone in the sphincter muscle around the urethra and leakage of urine.<sup>13,14</sup> Since both OVH and OVE result in removal of the ovaries, and therefore the source of estrogen, it is expected that there would be no difference in incidence of urinary incontinence between the procedures. There have been no studies to date that have found a statistical difference in occurrence of urinary incontinence between OVH and OVE procedures. One study reported a 20.8% incidence in OVE dogs compared to 19.1% in OVH however this was not a statistically significant difference.<sup>15</sup> Okkens et al.<sup>4</sup> reported 8.7% of OVE dogs and 13.6% OVH dogs developed urinary incontinence. However this difference was also not statistically significant.<sup>4</sup> No difference was found in the study by Ruckstuhl<sup>18</sup> either.

### **Conclusion:**

Despite the less invasive nature of OVE, there are no statistically significant differences in surgical time, pain, granuloma formation, or incidence of hormone-responsive urinary incontinence between the two procedures. Research supports a lower incidence of intra-abdominal hemorrhage with OVE because the ovarian pedicles are the only source of blood loss.<sup>1,2</sup> Postoperative vaginal bleeding is limited with OVE because the uterine horns are left

intact.<sup>1,2</sup> More research is needed to define differences in the incidence of ovarian remnants and accidental ureter ligation between the two procedures.

Ultimately, both sterilization procedures are associated with risks and have equivalent outcomes for sterilizing healthy female dogs.<sup>5</sup> Adequate research is lacking on this topic. More controlled experimental studies are needed in this area to objectively compare the two procedures. For now, the choice between OVE and OVH is surgeon preference. The surgeon should also consider their own comfort and experience with either procedure, the technique they were taught, and the risks associated with both procedures.

We believe it is valuable for veterinary educators to teach both OVE and OVH procedures in school. With the increasing popularity of laparoscopic procedures, we think it's valuable to teach OVE. We also think it's still important to teach OVH, to help surgeons to feel adequately equipped to treat pyometras and uterine neoplasia. Teaching both procedures would allow a surgeon to decide which technique they prefer and are more comfortable performing.

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