

The incidence of uterine pathology in ovariectomised bitches

A Knowledge Summary by

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PICO question

What is the incidence of postoperative uterine pathology in ovariectomised bitches compared to ovariohysterectomised bitches?

Clinical bottom line

Category of research question

Incidence

The number and type of study designs reviewed

Three retrospective case series

Strength of evidence

Weak

Outcomes reported

None of the reviewed case series found any uterine pathology for ovariectomised bitches in the long-term follow-up of several years, although none of the studies performed a proper gynaecological examination to confirm a lack of pathology

Conclusion

With the limited evidence available, it appears that leaving the uterus when gonadectomising bitches does not seem to have a high risk for developing pathology as long as the ovaries are completely removed

[How to apply this evidence in practice](#)

The application of evidence into practice should take into account multiple factors, not limited to: individual clinical expertise, patient's circumstances and owners' values, country, location or clinic where you work, the individual case in front of you, the availability of therapies and resources.

Knowledge Summaries are a resource to help reinforce or inform decision-making. They do not override the responsibility or judgement of the practitioner to do what is best for the animal in their care.

Clinical Scenario

You work at a small animal clinic and an owner comes to you with her intact female dog to discuss gonadectomy. She has heard that it is better to remove the uterus together with the ovaries because of the risk for the development of pyometra than to leave the uterus in the bitch. She wants to know your opinion on this subject.

The evidence

Three papers were identified which addresses the PICO question and meet the inclusion and exclusion criteria applied. All three studies identified were retrospective case series. The number of cases included in the studies was moderately high: 278 (Corriveau et al., 2017), 264 (Okkens et al., 1997) and 72 (Janssens & Janssens, 1991).

The studies describe short- and long-term outcomes after different surgical sterilisation methods in bitches: laparoscopic ovariectomy (LapOVE) and laparoscopic ovariohysterectomy (LapOVH) (Corriveau et al, 2017), ovariectomy and ovariohysterectomy via laparotomy and ovariectomy (Okkens et al, 1997) and bilateral flank ovariectomy (Janssens et al, 1991). All of the studies also include an owner questionnaire to identify long-term complications. The subjective nature of owner assessment may introduce bias.

Corriveau et al. (2017) compared the outcome between laparoscopic ovariectomy with ovariohysterectomy in 278 cases, the medical records were examined and responses to a questionnaire were developed and provided. None of the dogs in the two groups that were available during a 10 year follow-up (207 out of 278) developed clinical signs of uterine pathology.

Okkens et al. (1997) compared the outcome of 264 bitches that had been randomly selected for either ovariectomy or ovariohysterectomy. A questionnaire concentrated on the occurrence of problems related to abnormalities of the urogenital tract (i.e. vaginal discharge, attracting male dogs, and urinary incontinence) was sent to the owners 8 to 11 years after surgery. Complete data from 69 bitches in the ovariectomy group and for 66 bitches in the ovariohysterectomy group (135 out of 264) were available and analysed. No symptoms from the abdominal cavity as a consequence of the surgery were observed by any of the owners. Vaginal discharge was reported in two bitches in each group, the discharge was not severe and not accompanied by any apparent illness. **Ovariectomy:** discharge started 6 and 10 years after surgery, the discharge was colourless and was noticed in regular, but not cyclic, time intervals. **Ovariohysterectomy:** discharge started 3 months and 10 years after surgery, the discharge was whiteish and occurred regularly but not cyclic. Only one of these four bitches was presented to a veterinarian because of this problem, the article does not say what kind of diagnostics were used to examine the dog and no conclusion of the cause of the discharge is mentioned. None of the bitches were sexually attractive to male dogs after the sterilisation procedure.

Janssens & Janssens (1991) described the outcome in 72 bitches that underwent bilateral flank ovariectomy, the owners received a questionnaire between 4 and 9 years after the operation and none of the bitches had developed pyometra.

Article	Ovariectomy (number)	Ovariohysterectomy (number)	Follow-up time (years)	Uterine pathology (%)
Corriveau et al. (2017)	147	131	14 d – 10 y	0
Okkens et al. (1997)	126	138	8–11	0
Janssens & Janssens (1991)	72	0	4–9	0

Even though the evidence presented in the three articles is far from the ideal grade I (meta-analyses of randomised, controlled trials or evidence obtained at least from one properly randomised, controlled trial), the high number of cases all presenting the same result, no signs of uterine pathology, is suggestive that leaving the uterus during gonadectomy does not appear to dramatically increase the occurrence of pyometra and may be considered reasonably safe. To raise the quality of the evidence, these bitches should have undergone a proper gynaecological examination.

Summary of the evidence

Corriveau et al. (2017)	
Population:	Female neutered dogs, located in the USA, from 125 breeds. Most common breeds included Great Dane (11%), Labrador Retriever (10%) and Golden Retriever (6%). Dogs were required to have undergone a LapOVH or a LapOVE. Cases were excluded if records were incomplete, sterilisation was performed because of a neoplastic process, or the dog was found to have previously been sterilised.
Sample size:	278 dogs: <ul style="list-style-type: none"> • LapOVH n= 131 • LapOVE n=147
Intervention details:	<p>The medical record database of the Ryan Veterinary Hospital of the University of Pennsylvania was reviewed to identify eligible cases. The medical records from shelter-owned and client-owned female dogs undergoing LapOVH or LapOVE during a 14 days to 10-year period from October 2003 through October 2013 were included.</p> <p>Data collected from the medical record consisted of breed, age, body weight, body condition score, history of urinary tract abnormalities, preoperative systemic disease, number of laparoscopic ports used, surgeon experience, total duration of anaesthesia, LapOVE or LapOVH procedure time, additional procedures performed, intraoperative surgical complications, immediate postoperative complications, duration of hospitalisation, and short-term postoperative incisional complications.</p> <p>Long-term follow-up (>14 days to 10 years after surgery) to assess postoperative complications and overall owner satisfaction was conducted by means of a questionnaire administered by telephone or email.</p> <ul style="list-style-type: none"> • Questions were phrased to allow for initial 'yes' or 'no' responses by the owner regarding postoperative development of urinary incontinence, signs of oestrus, or pyometra as diagnosed by a veterinarian. • If a complication was noted, additional information was requested, including time of onset of clinical signs or diagnosis, any diagnostic testing performed and any treatment performed.
Study design:	Retrospective case series

<p>Outcome studied:</p>	<p>The short- and long-term follow up information regarding complications after LapOVH vs LapOVE</p>
<p>Main findings: (relevant to PICO question):</p>	<p>Short-term follow-up information (≤ 14 days after surgery) was available for 91/131 (69.4%) in the LapOVH group and 133/147 (90.5%) in the LapOVE group. In total 54 dogs were lost to short-term follow-up.</p> <ul style="list-style-type: none"> • Short-term postoperative incisional complications including erythema, seroma, or infection were reported in 15/224 dogs (6.7% of dogs that were available for follow-up) and were not significantly associated with the procedure. • For every additional 30 minutes of anaesthetic time, the odds of developing an incisional complication increased by 24%. • Dogs that developed an immediate postoperative complication were 6.67 times as likely to develop an incisional complication. • In summary results in the present 10-year (2003 through 2013) retrospective study suggests that short- and long-term outcomes were similar for the dogs undergoing sterilisation by means of LapOVH or LapOVE. <p>Long-term follow-up information was available for 82/131 patients (62.6%) in the LapOVH group and in 125/147 patients (85%) in the LapOVE group.</p> <ul style="list-style-type: none"> • No dogs were reported to have exhibited signs of oestrus, pyometra or a persistent ovarian remnant following laparoscopic sterilisation. • Urinary incontinence occurred in 19/201 dogs (9.2%) and was associated with the LapOVH group on unadjusted analysis. However, on multivariable analysis, procedure was not independently associated with urinary incontinence following surgery, but was a confounding factor in the association between preoperative urinary tract abnormalities and postoperative incontinence. • After adjusting for body weight, duration of follow-up, and procedure (LapOVH vs LapOVE), dogs with preoperative urinary tract abnormalities, including incontinence, urinary tract infection, or calculi, were 3.27 times as likely to have postoperative urinary incontinence as were dogs without a history of preoperative urinary tract abnormalities. • Of the 182 dogs with no preoperative urinary tract abnormalities, 13 (7.1%) were reported to have postoperative urinary incontinence. • Overall, owners of 205/207 dogs (99%) for which long-term follow-up information was available, reported that they were satisfied with the surgery.
<p>Limitations:</p>	<ul style="list-style-type: none"> • Retrospective case series provide low-level evidence. • No other diagnostic tests were used to confirm that the remaining uterus was healthy; no blood samples were taken, no vaginal cytology was done and no ultrasound of the uterus was performed.

	<ul style="list-style-type: none"> • The study did not include laparotomy surgery. If removing only the ovaries in open surgery affects the remaining uterus it was not investigated. • The article does not say how much time may have passed since surgery and the performance of the questionnaire in each individual case. • In the LapOVE group approximately 37% of dogs were lost to follow-up, in the LapOVH group 15% of dogs were lost to follow-up. Since the fate of the dogs lost at follow-up can't be assessed it can't be estimated if there are more complications with one method or the other.
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Okkens et al. (1997)	
Population:	<p>Female neutered dogs, located in the Netherlands. Breeds represented with more than six bitches were German Shepherds (11), Bouviers des Flandres (11) and Dobermanns (8). The age of the bitches at the time of surgery ranged from 0.8–9.9 years (median 1.5 years) in the ovariectomy group and from 1.0–12.0 years (median 2.5 years) in the ovariohysterectomy group. All bitches had experienced at least one oestrus before neutering. The body mass at the time of the surgery ranged from 1.6 to 37.5 kg (median 22.0 kg) in the ovariectomy group and from 5.0 to 37.5 kg (median 20.5 kg) in the ovariohysterectomy group.</p> <p>Cases were excluded if records were incomplete, sterilisation was performed because of a neoplastic process or the dog was found to have previously been sterilised.</p>
Sample size:	<p>264 neutered dogs:</p> <ul style="list-style-type: none"> • 126 ovariectomised • 138 ovariohysterectomised
Intervention details:	<ul style="list-style-type: none"> • A questionnaire was sent to 264 owners of bitches as follow-up to a routine neutering procedure performed 8 to 11 years earlier. • The bitches were randomly selected for either ovariectomy or ovariohysterectomy. • Both the ovariectomy group and the ovariohysterectomy group were neutered through a caudal midline incision. • Complete data analysis became available for 69 bitches in the ovariectomy group (54.7%) and for 66 bitches in the ovariohysterectomy group (47.8%). • The questionnaires concentrated on the occurrence of problems that could possibly be related to abnormalities of abdominal organs, such as abdominal pain, and particularly to abnormalities of the urogenital tract, i.e. vaginal discharge, attraction of male dogs and urinary incontinence. • If an owner responded positively to one or more of the questions, a detailed telephone interview concerning the signs of the problem, duration and timing of the problem, treatments, etc., was carried out.

Study design:	Retrospective randomised case series
Outcome studied:	Comparison between differences in short-term and long-term complications after ovariohysterectomy vs ovariectomy
Main findings: (relevant to PICO question):	<ul style="list-style-type: none"> • None of the bitches were sexually attractive to male dogs after the neutering procedure. • No abdominal problems as a consequence of the surgery were observed by any of the owners. • Vaginal discharge was reported in two bitches in each group, the discharge was not severe and not accompanied by any apparent illness. • Ovariectomy: discharge started 6 and 10 years after surgery, the discharge was colourless and occurred regularly but not cyclic. • Ovariohysterectomy: discharge started 3 months and ten years after surgery, the discharge was whitish and was noticed in regular but not cyclic time intervals. • There were no significant difference between the ovariectomy and ovariohysterectomy group in the incidence of urogenital problems listed during the follow-up period of 8 to 11 years. • Ovariectomy does not increase the risk of cystic endometrial hyperplasia (CEH) – endometritis or other complications compared with ovariohysterectomy.
Limitations:	<ul style="list-style-type: none"> • It was a retrospective study, which is lower on the evidence hierarchy compared to for example a randomised multi-centre prospective study. • No other diagnostic tests were used to confirm that the remaining uterus was healthy; no blood samples were taken, no vaginal cytology done and no ultrasound or other diagnostic methods of the uterus was performed. • The article does not say how much time may have passed since surgery and the performance of the questionnaire in each individual case. • In the ovariectomy group approximately 45% of dogs were lost to follow-up, in the ovariohysterectomy group about 42% of dogs were lost to follow-up. Whether the dogs left for follow-up developed uterine pathology or remained healthy is not clear and must be taken into account.

Janssens & Janssens (1991)	
Population:	Ovariectomised female dogs from 27 different breeds. The weight of the bitches at the time of surgery ranged from 1.3 and 55 kg (mean 15.3 kg) and the age varied between 0.5–7.0 years (mean 2.2 years).
Sample size:	72 dogs
Intervention details:	<ul style="list-style-type: none"> • The dogs underwent bilateral surgical flank approach and the ovaries were removed. The surgery was performed between 1 and 4 months after oestrus.

	<ul style="list-style-type: none"> • If uterine abnormalities were observed the uterus was also removed. • A questionnaire was handed out to 72 owners between 4 and 9 years after the operation. • The questionnaires concentrated on the occurrence of long-term problems: weight gain, hair-shedding, coat changes, character changes, urinary incontinence and the development of pyometra.
Study design:	Non-comparative retrospective case series
Outcome studied:	Determination of short-term and long-term complications after ovariectomy
Main findings: (relevant to PICO question):	<p>In one dog an enlarged uterus was removed. In one obese dog the ovarian bursa was not found on the left side. Therefore, a ventral midline incision was used to approach this ovary.</p> <p>Short-term complications:</p> <ul style="list-style-type: none"> • blood-loss from the surgical wound 4/72 (6%) • seroma formation 16/72 (22%) • wound infection 2/72 (2.8%) • herniation (0%) <p>Long-term complications:</p> <ul style="list-style-type: none"> • development of pyometra (0%) • weight gain 43/72 (60%) • hair-shedding 19/72 (26%) • coat changes 5/72 (6.9%) • character changes – less active 21/72 (29%), aggressive towards other dogs 16/72 (22%) • urinary incontinence 13/72 (18%)
Limitations:	<ul style="list-style-type: none"> • No other diagnostic tests were used to confirm that the remaining uterus was healthy; no blood samples were taken, no vaginal cytology done and no ultrasound or other diagnostic methods of the uterus were performed. • There were no defined exclusion or inclusion criteria. • The article does not say how the data from the short-term complications were collected, did they see the animals at the clinic or did they ask the owners? • The article does not say how much time may have passed since surgery and the performance of the questionnaire in each individual case.

Appraisal, application and reflection

Only three studies were identified that addressed the PICO question and these studies were retrospective case series. Thus, the evidence base for answering the question is limited, but at least all three of the studies did not report a case where uterine pathology developed in an ovariectomised bitch.

Van Goethem et al. (2006) reviewed the outcome for ovariectomy and ovariohysterectomy, and they found that there was no difference in outcome when they analysed the present literature comparing the two methods. Ovariectomy did not lead to any pathologic changes in the remaining uterus. Bitches undergoing ovariectomy did not show symptoms of pyometra or endometritis years after the surgery.

In 1958, Dow reported the ability to experimentally induce cystic endometrial hyperplasia (CEH) or CEH-endometritis by administration of progesterone, even in ovariectomised bitches. Withdrawal of the progesterone treatment causes regression of the experimentally produced disease. Similarly, ovariectomy leads to regression of the natural disease (Dow, 1958), thus exposure to progestogen appears to be necessary for the development of CEH-endometritis and that is the main proposed answer to why the uterus seems to remain healthy after ovariectomy (Okkens et al. 1997).

Stump pyometra have been reported in bitches that have had an improperly performed ovariohysterectomy in association with ovarian remnant syndrome, breaks in aseptic technique, or exogenous progesterone administration (De Tora & McCarthy, 2011; Van Goethem et al., 2006; Janssens & Janssens, 1991; and Okkens et al., 1997).

Uterine neoplasia can develop after ovariectomy; however, uterine tumors are reportedly rare (0.03%) and are benign in 85% to 90% of the cases (Brodey, 1967). Therefore, the overall risk has to be balanced against the disadvantages of ovariohysterectomy compared with ovariectomy in terms of surgical time, additional trauma, and potential complications.

It is important to note that none of the articles reviewed performed any diagnostic tests as part of the follow-up, and all three articles relied solely on owner responses to the questionnaires for data on uterine pathology or ovarian remnants. Also, in the study by Corriveau et al. (2017) 15% of the patients in the group that underwent ovariectomy were lost to follow-up and in the study by Okkens et al. (1997) 45% of the ovariectomised patients were lost to follow-up and the status of the remaining uterus in those patients is unknown.

To bring more evidence to properly answer the PICO question, a randomised multi-centre prospective study should be done with active follow-up including diagnostic workup (ultrasound, vaginal cytology, luteinizing hormone (LH) test, anti-muellerian-hormone tests etc.) to confirm the lack of uterine pathology or ovarian remnant occurring for a period of at least 5 to 10 years after the surgery.

Methodology Section

Search Strategy	
Databases searched and dates covered:	CAB Abstracts on the OVID interface 1973–2020 Week 03 PubMed accessed via the NCBI website 1910–Jan 2020
Search terms:	<p>CAB Abstracts:</p> <ol style="list-style-type: none"> (dog or dogs or canine or canines or canis or bitch or bitches) or exp dogs/ or exp bitches/ or exp canis/ (spey* or spay* or neuter* or ovariectom* or ovariohysterectom* or ovario-hysterectom* or hysterectom* or sterilis* or steriliz* or desex* or de-sex* or gonadect*) or exp ovariectomy/ or exp sterilization/ or exp hysterectomy/ or exp gonadectomy/ (pyometra or hydrometra or mucometra or uterine neoplasia or endometrial hyperplasia) ((uterine or uterus) and (disease* or pathology)).mp. or exp uterine diseases/ 1 and 2 and (3 or 4) <p>PubMed:</p> <ol style="list-style-type: none"> (dog OR canine OR bitch OR canis) (spey or spay or neuter or ovariectomy or ovariohysterectomy or ovario-hysterectomy or hysterectomy or sterilise or sterilize or desex or de-sex or gonadectomy) (pyometra or hydrometra or mucometra or uterine neoplasia or endometrial hyperplasia) (uterine or uterus) and (disease or pathology) 1 and 2 and (3 or 4)
Dates searches performed:	24 Jan 2020

Exclusion / Inclusion Criteria	
Exclusion:	<ul style="list-style-type: none"> • Non-English language • Wrong species • Articles not about uterine pathology after neutering • Conference proceedings and commentaries
Inclusion:	<ul style="list-style-type: none"> • Only articles about uterine pathology after neutering • Full text articles available in English • Dogs only

Search Outcome						
Database	Number of results	Excluded – Not relevant to the PICO question	Excluded – Not in English	Excluded – Review papers, proceedings, conference papers or book chapters	Excluded – Wrong species	Total relevant papers
CAB Abstracts	578	424	94	32	25	3
PubMed	317	251	22	8	34	2
Total relevant papers when duplicates removed						3

CONFLICT OF INTEREST

The author declares no conflicts of interest.

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