

SURGERY · SOFT TISSUE · ILLUSTRATED GUIDE

CANINE SPAY (OVH)

Canine Spay (OVH): The Ovariohysterectomy, Step by Step (PDF)

The canine spay procedure is a short list of steps in which almost every step has one detail that decides whether it goes well. Inside: Eight labelled figures and three reference tables.

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IN SHORT

The **canine spay procedure** is a short list of steps in which almost every step has one detail that decides whether it goes well. Site the incision over whatever is hardest to reach — **the ovaries in an adult, the uterine body in a puppy**. Do not tie the forelimbs forward: it tightens the suspensory ligaments you are about to fight. Clamp the pedicle with **graded pressure, transect before you ligate**, and place a single secure ligature clear of the crushing instrument. Look at every stump before it goes back in. And for a healthy bitch, the evidence now favours **ovariectomy** over removing the uterus as well. Free one-page checklist included.

KEY POINTS

1. **Incision placement beats incision length.** Adult bitch: just caudal to the umbilicus. Puppy under five months: further caudal. Long incisions are slower to close and more traumatic without buying you the exposure you actually need.
2. **Do not tie the forelimbs cranially.** It is routinely taught and it works against you — it increases tension on the ovarian suspensory ligaments.
3. **Graded clamping, one–two–three clicks.** The proximal clamp is deliberately not closed fully, because a completely crushed pedicle is a pedicle that tears.
4. **Transect before you ligate.** Better visibility, less handling, and less chance of catching the wrong tissue — then one well-placed ligature is enough.
5. **Never ligate hard against a clamp.** Tissue fans out around the jaws and the knot cannot tighten onto it.
6. **Look at every stump before releasing it.** A dropped bleeding pedicle is the hardest thing in the abdomen to find twice.
7. **Stump pyometra comes from ovarian tissue, not uterine tissue.** Pyometra cannot happen without ovarian hormones, which changes what you should be meticulous about.

About this article

The operative sequence here follows the canine ovariohysterectomy described by Bushby and White in *High-Quality, High-Volume Spay and Neuter and Other Shelter Surgeries*, with *Current Techniques in Small Animal Surgery*, 5th ed. Where a statement comes from the comparative literature rather than from those texts — principally the ovariectomy-versus-ovariohysterectomy evidence — it is attributed in place. This is a description of technique for qualified and supervised readers, not a substitute for training under supervision.

Every practice does this operation, most new graduates are nervous of it, and almost all of the difficulty is concentrated in about four moments: getting the ovary to reach the incision, getting the clamp pressure right, getting the ligature in the right place, and knowing what to look at before you let go of a stump.

What follows is the **canine spay procedure** as an operative sequence, with the reason behind each step rather than just the instruction. Several of those reasons contradict what is commonly taught, and they are flagged where they do.

01 Why the detail matters

A bitch spay is a healthy-patient operation. That is precisely what makes its complications intolerable: there is no underlying disease to blame, and the two that matter — **haemorrhage** and **ovarian remnant syndrome** — are both, in almost every case, consequences of technique rather than of bad luck.

The useful way to hold the operation in your head is that it is a series of decisions about *tension* and *exposure*. Nearly every problem in a routine spay traces back to a structure that would not come far enough out of the incision, and nearly every solution is about releasing tension somewhere else rather than pulling harder.

02 Before you start: prep, kit and suture

None of the technique below matters if the patient arrives on the table unprepared, and a student following a step list will not get this from the step list.

The patient. Confirm she is what you think she is: check for an existing spay scar or tattoo, confirm age and weight, and ask specifically about **oestrus** and possible pregnancy — both make the pedicles and uterine vessels dramatically more vascular and change how carefully you work. Follow the practice fasting protocol, place an intravenous catheter, and give premedication and analgesia *before* the incision rather than after it: pre-emptive analgesia is standard of care, and our NSAIDs guide covers dosing and the contraindications that matter in a surgical patient.

Preparation and draping. Clip generously — a clip that is too small is the commonest reason a surgeon cannot extend an incision when they need to. Aseptic skin preparation, then drape to leave the whole ventral midline from xiphoid to pubis accessible, not just the length you expect to use. You are draping for the operation you might have to do, not the one you hope to do.

The pack. Scalpel handle and blade, thumb forceps (rat-toothed or Adson-Brown), Metzenbaum and Mayo scissors, several **curved hemostats** or **Carmalts** — you need at least three free at the moment you clamp a pedicle — needle holders, a **spay hook**, towel clamps and swabs. Count your swabs in and out.

Suture. The article above deliberately says pattern is surgeon's preference; *material* is less arbitrary. **Synthetic monofilament absorbable** suture is by far the most commonly used in high-volume spay-neuter, and for good reason: monofilament has no interstices for bacteria and absorbable material needs no removal. In practice that means **poliglecaprone 25 (Monocryl)** or **polydioxanone (PDS II)**, with braided **polyglactin 910 (Vicryl)** also in common use. Absorbable suture loses its tensile strength within about 60 days. Match size to patient: the same ligature that is right on a 30 kg bitch's pedicle is absurd on a 4 kg terrier, and an over-thick suture ties a poor knot on a small pedicle.

One thing to check twice Braided suture is easier to handle but coating it to reduce bacterial colonisation can **significantly decrease knot security**. On an ovarian pedicle, where a single ligature is carrying the whole responsibility, knot security is the property you care about most.

03 OVE or OVH? What the evidence says

Before the technique, the question the technique assumes an answer to. Most curricula teach removal of the ovaries *and* uterus, and most practices do it. The comparative literature does not support that as the default for a healthy bitch.

	OVARIOHYSTERECTOMY (OVH)	OVARECTOMY (OVE)
What is removed	Both ovaries and the uterus	Both ovaries only
Incision & trauma	Longer incision, more intra-abdominal manipulation	Smaller incision, less surgical trauma, less reported pain
Operating time	Longer — technically the more complicated of the two	Shorter <i>in experienced hands</i> ; the advantage disappears with inexperienced surgeons
Later pyometra	No advantage demonstrated	No difference found — pyometra needs ovarian hormones
Urinary incontinence	No difference found	No difference found
Still the right call when...	There is uterine disease — pyometra, pregnancy, uterine trauma — i.e. the uterus itself is the problem	It is the routine elective spay of a healthy bitch

The traditional argument for taking the uterus was that it protected against later pyometra and, for some, against urinary incontinence. Neither has held up: comparisons of the two procedures have found **no significant difference in long-term urogenital problems, including**

pyometra and urinary incontinence. The reason is the one that runs through the rest of this article — **pyometra requires ovarian hormones**, so a uterus left behind in a correctly ovariectomised bitch is not a uterus at risk.

Where this leaves youOvariectomy is a reasonable default for the routine elective spay of a healthy bitch, and ovariohysterectomy remains correct whenever the uterus itself is diseased — pyometra, pregnancy, trauma. One honest caveat from the same literature: **ovariectomy is not faster and does not need a smaller incision when performed by an inexperienced surgeon.** The advantage is real but it is not automatic. *(Comparative evidence: JAVMA and the surgical review literature, rather than the two operative texts this article otherwise follows.)*

04 The anatomy you are actually dividing

Four structures, and knowing which is which is most of the operation. The **suspensory ligament** runs from the ovary cranially to the body wall near the last rib — it is the tether that stops the ovary reaching your incision, and it is the one you deliberately break down. The **ovarian pedicle** carries the ovarian artery and vein and is the structure you ligate. The **proper ligament** joins ovary to uterine horn and is the handle you use for traction throughout. The **broad ligament** is the sheet suspending the whole tract, and you tear a window in it to isolate the pedicle.

What holds the ovary — and what bleeds

Release one, ligate one, hold one, window the fourth.

SUSPENSORY LIGAMENT — you RELEASE this

Ovary to body wall near the last rib. The tether that stops the ovary reaching your incision.

Cut or tear it. Until it is down, an adult ovary will not exteriorise.

OVARIAN PEDICLE — you LIGATE this

Carries the ovarian artery and vein. One secure ligature, clear of any crushing clamp.

This is the structure that kills if it is got wrong.

PROPER LIGAMENT — you HOLD this

Ovary to uterine horn. Your handle throughout the operation.

Traction here is what tensions the suspensory ligament and makes it findable.

BROAD LIGAMENT — you WINDOW this

Tear caudal to the ovarian vessels, so the ligature takes the pedicle and nothing else.

Right ovary sits further cranial — harder to exteriorise, and the one more often left behind.

Fig 1 — What holds the ovary, and what bleeds. The **suspensory ligament** is what you release; the **ovarian pedicle** is what you ligate; the **proper ligament** is what you hold. Confusing the first two is how a pedicle gets torn.

Two asymmetries are worth carrying with you. The **right ovary sits further cranial** than the left, which makes it the harder of the two to exteriorise — and, as a direct consequence, the one more often left incompletely excised. And the **spleen** lies on the left, directly where a spay hook sweeps. Our canine abdominal anatomy guide covers the surgical topography in full.

05 The procedure, step by step

Eleven steps. The middle column is what to do; the right-hand column is why, because the why is what you fall back on when the anatomy does not look like the diagram.

STEP	WHAT YOU DO	WHY IT IS DONE THAT WAY
1 • Position before you scrub	Dorsal recumbency. Secure the forelimbs along the thoracic wall , or leave them untied.	Pulling the forelimbs cranially and tying them there — <i>as is routinely taught</i> — increases tension on the ovarian suspensory ligaments and makes the ovaries harder to exteriorise, not easier.

STEP	WHAT YOU DO	WHY IT IS DONE THAT WAY
2 · Site the incision age changes the answer	Adult bitch: ventral midline just caudal to the umbilicus . Puppy under five months: further caudal, just cranial to the midpoint between umbilicus and pubis. Skin incision 1–3 cm .	Site it over whatever is hardest to reach. In the adult the ovaries are the difficulty; in the puppy it is the uterine body . Long incisions are slower to close and more traumatic — exposure is bought with placement, not length.
3 · Enter the abdomen	Dissect subcutis only as far as needed to see the linea alba. Grasp it with thumb forceps, elevate , nick with the blade, and extend the incision with the linea still elevated.	Elevating lifts the body wall clear of viscera before the blade goes through it. The paramedian alternative enters 0.5–1.5 cm right of the linea, separating rectus fibres bluntly, to equalise the reach to the more cranial right ovary.
4 · Find the horn spay hook	Pass the hook down the right abdominal wall, sweep it medially at the dorsolateral wall, and elevate. Several passes is normal; try the left if the right will not come.	The right side is worked first because the right ovary is the more cranial and the harder of the two. On the left the spleen lies directly in the hook's path — the structure a blind sweep is most likely to injure.
5 · Break down the suspensory ligament	Hemostat on the proper ligament , upward traction, and press down on the body wall at the incision. Cut or tear the taut suspensory ligament.	Traction on the proper ligament is what puts the suspensory ligament under tension and makes it findable. Until it is released the ovary will not reach the incision in an adult dog.
6 · Isolate the pedicle	Tear a window in the broad ligament caudal to the ovarian vessels .	This is what separates vessels from fat and mesentery, so that the ligature goes around the pedicle and nothing else.
7 · Clamp: one, two, three clicks the detail that prevents tearing	Three clamps: first proximal on the pedicle, second several millimetres distal to it but still proximal to the ovary, third on the proper ligament . Close the first one click, the second two , the third three .	Graded closure deliberately avoids completely crushing the tissue at the most proximal clamp — a fully crushed pedicle there is predisposed to tearing, and that is the pedicle you are about to trust to a single ligature.
8 · Transect, then ligate this order, not the reverse	Transect the pedicle just distal to the second clamp. Then place a single ligature with a modified Miller's knot, sited just proximal to the first clamp — and remove that clamp before pulling the knot tight .	Transecting first gives visibility and needs less handling of the pedicle, lowering the chance of damaging it or catching the wrong tissue in the ligature. Removing the clamp first drops the ligature into the crushed groove it leaves. A ligature set too close to a clamp cannot tighten properly, because the tissue fans out around the jaws.
9 · Check before you let go	Grasp the stump with thumb forceps, release the clamp, and watch it before returning it to the abdomen.	A pedicle you have already dropped is the hardest bleeding point in the abdomen to find again. These five seconds are the cheapest in the whole operation.
10 · Second side, then the uterine body	Repeat identically. Reflect both horns caudally, take the broad ligaments down to the level of the uterine vessels — ligating them first if they are vascular — and place a single modified Miller's knot on the uterine body close to the cervix.	Tighten until you see tissue blanching under the ligature. Do not crush the uterus first: a friable uterus tears. Clamp distal, cut between ligature and clamp, and leave several millimetres of stump so the ligature cannot slip off.
11 · Close	The holding layer is the external rectus fascia . Continuous, interrupted or cruciate are all acceptable. Close subcutis and skin separately or together; a subcuticular skin closure needs no suture removal.	An Aberdeen knot ends a continuous line as securely as a square knot with less bulk — two throws for subcuticular or intradermal, three or four for the linea.

The pedicle, in the order it is actually done

Graded pressure → transect → ligate. Not the order most students are taught.

1 • THREE CLAMPS, GRADED: 1 • 2 • 3 CLICKS

Proximal on pedicle (1 click) · several mm distal, proximal to ovary (2) · proper ligament (3).

The proximal clamp is deliberately NOT closed fully — a crushed pedicle tears.

2 • TRANSECT — before you ligate

Cut just distal to the second clamp. Better visibility, far less handling of the pedicle.

3 • ONE LIGATURE — modified Miller's knot

Place it just proximal to the first clamp. REMOVE that clamp, then pull tight — the knot drops into the groove the clamp left. Finish with 3–4 square throws.

NEVER tie hard against a closed clamp

Tissue fans out around the jaws and the ligature cannot tighten onto it.

4 • Release the clamp and WATCH the stump before it goes back in.

Fig 2 — The pedicle, in the order it is actually done. Graded clamp pressure, **transect before ligating**, and the ligature dropped into the groove left by the proximal clamp once that clamp is off. A knot tied hard against a closed clamp cannot tighten, because the tissue fans out around the jaws.

Phase 1 — getting in

The incision is short and its *level* is doing all the work. In an adult bitch the ovaries are what you will struggle with, so the incision sits just caudal to the umbilicus. In a puppy under five months the uterine body is the harder structure, so it moves caudally, to just cranial to the midpoint between umbilicus and pubis. Getting this wrong is why a spay that should take twenty minutes turns into an hour of dragging tissue toward a hole in the wrong place.

Through the linea alba, the sequence is: dissect subcutis only as far as you need to *see* the linea, grasp it with thumb forceps, **elevate**, nick it, and extend the incision with the linea still lifted. Elevating is not a flourish — it lifts the body wall off the viscera so the blade opens peritoneum and not spleen or bladder.

The **paramedian** alternative exists for one reason: the right ovary sits further cranial than the left and is therefore the harder of the two to reach. Entering 0.5 cm (small dog) to 1.5 cm (larger dog) to the *right* of the linea equalises the reach to both ovaries. Incise the external fascia without cutting rectus fibres — cut muscle bleeds — then push a hemostat through and open it to separate the fibres bluntly, and finally grasp and cut the peritoneum with Metzenbaums.

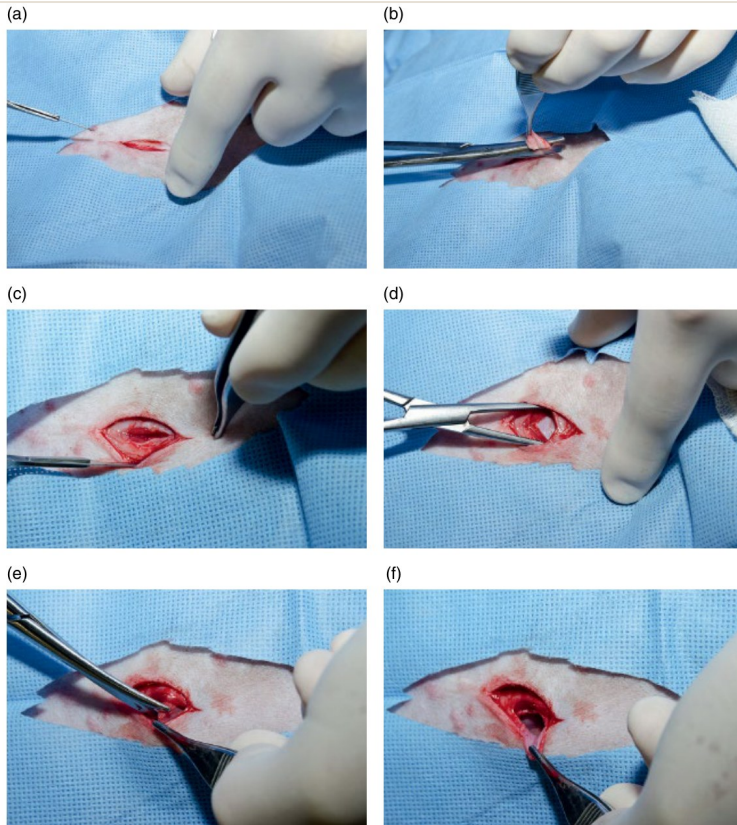


Figure 12.2 Paramedian incision. (a) Ventral midline skin incision. (b) Undermine to the right of the linea alba. (c) Incise the muscle fascia without cutting rectus muscle. (d) Bluntly separate muscle fibers. (e) Elevate and cut the peritoneum to enter the abdomen. (f) The peritoneum is incised, allowing entry into the abdomen. Source: Photos courtesy of Tom Thompson.

Fig 3 — Paramedian entry, stage by stage. Note (c) and (d): the fascia is *incised* but the rectus fibres are *separated bluntly*, not cut. That single distinction is the difference between a dry entry and one that oozes for the rest of the operation.

Phase 2 — getting the ovary out

This is where most of the difficulty in a bitch spay actually lives, and almost all of it is about **tension** rather than strength.

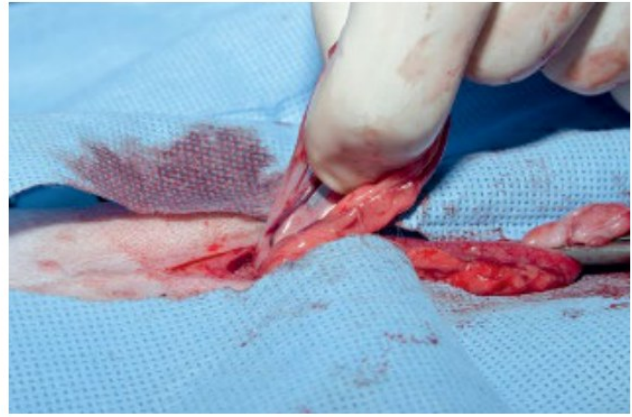
Pass the spay hook down the **right** body wall, sweep it medially once you reach the dorsolateral wall, and lift. Several passes is normal and not a sign you are doing it wrong. If the right horn will not come, try the left — but on the left the **spleen** lies directly in the hook's path, so a blind aggressive sweep there is how spleens get lacerated.

Once the horn is out, the ovary still will not reach your incision, because it is tethered cranially by the **suspensory ligament**. The manoeuvre that exposes it is specific: put a hemostat on the **proper ligament**, pull *upward*, and press down on the body wall at the incision edge with your other hand. The suspensory ligament comes up tight as a band under your finger, and only then can you see what you are cutting. Cut it, tear it, or break it down digitally — but break it down, because until it is released an adult ovary simply will not deliver.

(a)



(b)



(c)



Figure 12.3 Incising the suspensory ligament. (a) Grasp the proper ligament with a hemostat. (b) Apply upward tension, exposing the suspensory ligament. (c) Cut the suspensory ligament. *Source:* Photos courtesy of Tom Thompson.

Fig 4 — Why traction comes before the scissors. In (a) the hemostat is on the **proper ligament**; in (b) upward tension has turned the suspensory ligament into a visible, palpable band; only in (c) is it cut. Reaching in with scissors before (b) is how the pedicle gets cut instead.

Phase 3 — the pedicle

Everything before this was access. This is the step that can kill the patient, and it is worth slowing down for.

First isolate it: tear a **window in the broad ligament caudal to the ovarian vessels**, so that what you are about to ligate is vessels and not vessels-plus-fat-plus-mesentery. Then place three clamps — proximal on the pedicle, a second several millimetres distal to it but still proximal to the ovary, and a third on the proper ligament — and close them to **one, two and three clicks** respectively.

That graded pressure is not fussiness. The proximal clamp is deliberately *not* closed fully, because a pedicle crushed through at that point is predisposed to tearing — and that is precisely the pedicle you are about to trust to a single ligature. The distal clamps can be tighter because their job is only to hold.

Now **transect before you ligate**, cutting just distal to the second clamp. This is the reverse of what most students are taught, and the reasoning is practical: with the ovary off, you can see the pedicle properly and you barely have to handle it, which is what keeps you from tearing it or catching bowel, fat or ureter in the knot.

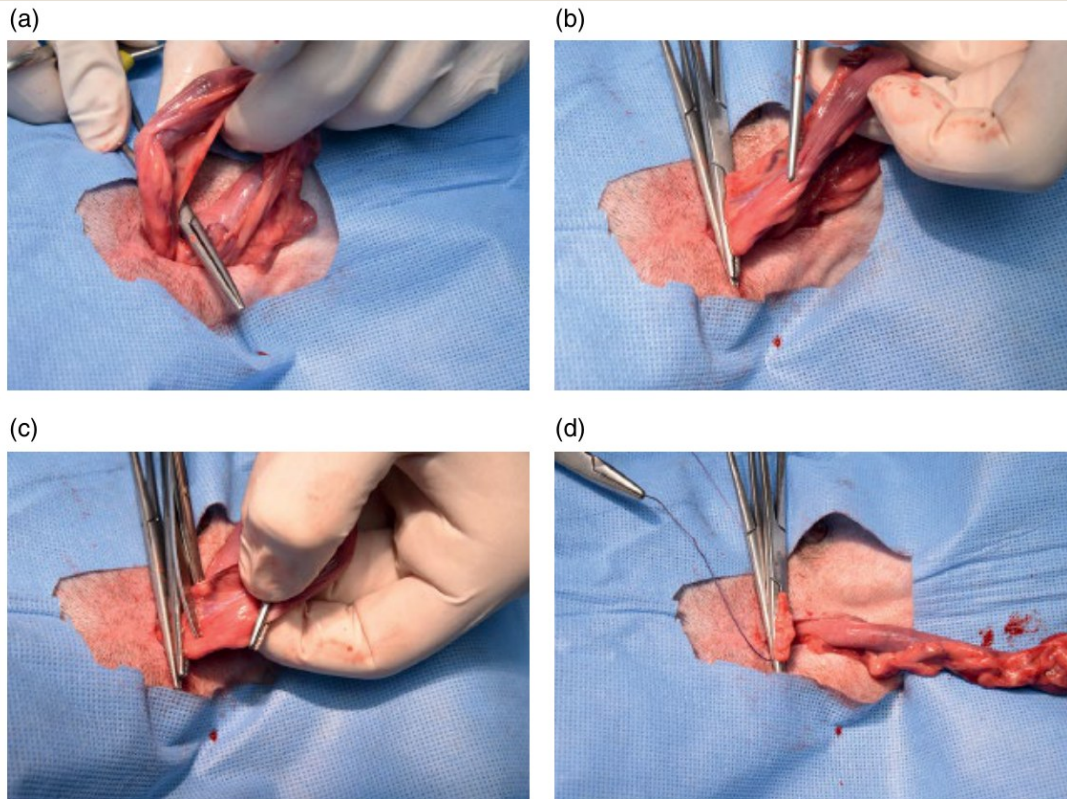


Figure 12.4 Ligating the ovarian pedicle with a modified Miller's knot. (a) A window is torn in the broad ligament to isolate the pedicle. (b) Three hemostats are placed: two on the pedicle, one on the proper ligament. (c) The pedicle is transected distal to the second hemostat. (d) Begin the modified Miller's knot: pass suture under the hemostat (or Carmalt). (e) Pass suture under the hemostat (or Carmalt) again, creating a loop, and pass the needle holder through the loop. (f) Wrap the long strand of suture once around the needle holder. (g) Grasp the short strand of the suture with the needle holder. (h) Pull the needle holder back out of the loop, creating the first throw of the knot. (i) Remove the most proximal hemostat (or Carmalt) and pull the first throw tight into the crushed area from the first hemostat (or Carmalt). (j) Place three or four more square knot throws, remove the remaining hemostat (or Carmalt), and check for hemorrhage.

Fig 5 — Window, clamps, transect. (a) the broad-ligament window isolating the pedicle; (b) the three clamps — two on the pedicle, one on the proper ligament; (c) transection *distal to the second clamp*; (d) the modified Miller's knot begins. The ovary is already off before any suture is placed.

Place the ligature just proximal to the most proximal clamp, then — before you pull it tight — **take that clamp off**. The knot drops into the crushed groove the clamp has left, which is the most secure place on the whole pedicle. Tie it there and a **single** ligature is enough.

Why you never tie hard against a closed clamp The tissue *fans out* immediately around the jaws. A ligature laid into that fan cannot be tightened onto a cylinder of tissue, because there is no cylinder — it is a flat spread. It feels tight as you pull it and it slips the moment the clamp comes off. Keep the ligature several millimetres clear of any crushing instrument.

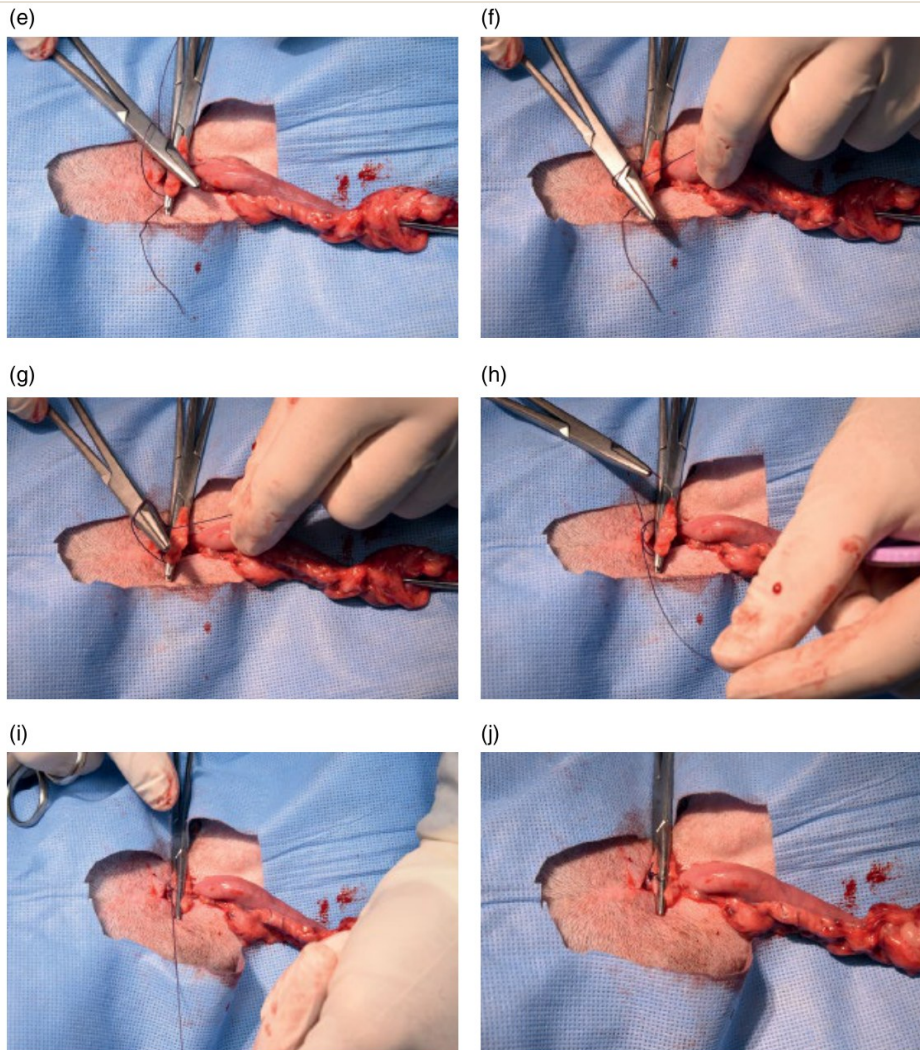


Figure 12.4 (Continued)

Fig 6 — The modified Miller's knot, completed. The loop is created, the needle holder passes through it, the long strand wraps once, the short strand is grasped and drawn back through — and in (i) the proximal clamp is removed *before* the first throw is pulled home, so the knot seats into the crushed area. Three or four square throws finish it.

Then the step that costs five seconds and prevents the worst outcome in the operation: grasp the stump with thumb forceps, release the clamp, and **watch it**. A pedicle that is going to bleed usually declares itself immediately. A pedicle you have already dropped back into the abdomen is the hardest bleeding point in a dog to find again — you will be following the caudal pole of the kidney cranially, through blood, with a patient that is losing pressure.

Phase 4 — the uterine body

Second ovary identically, then reflect both horns caudally to bring the uterine body and cervix into view. Take the broad ligaments down to the level of the uterine vessels — tear them if they are avascular, ligate them first if they are not.

A single modified Miller's knot goes on the uterine body close to the cervix. Tighten it until you see **tissue blanching** under the ligature; that colour change is the endpoint, not a number of throws. Do *not* crush the uterus with a clamp first — a friable uterus, which is exactly what you meet in the cases where this matters most, will tear. Place a clamp distal to the ligature, cut between the two, and leave **several millimetres of stump beyond the knot** so the ligature has something to hold and cannot slip off the cut end.

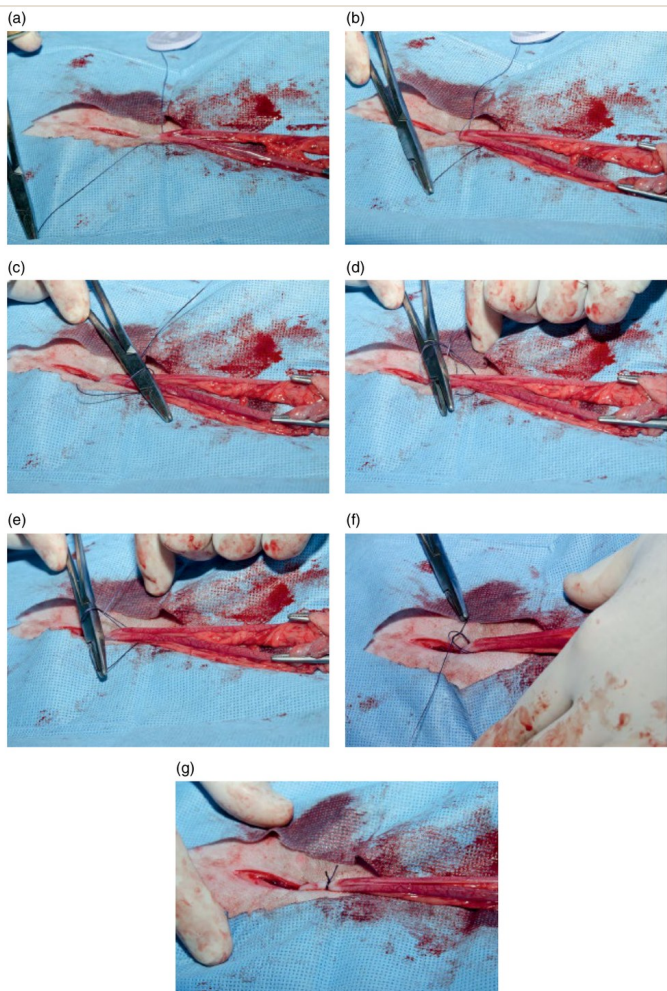


Figure 12.5 Modified Miller's knot on the uterine body. (a) Pass suture under the uterine body. (b) Pass suture under the uterine body again, creating a loop. (c) Pass the needle holder through the loop. (d) Wrap a long strand of suture around the needle holder. (e) Grasp a short strand of suture with the needle holder. (f) Pull the needle holder toward the surgeon and the long strand away from the surgeon, tightening the first throw. (g) Place three or four more square knot throws and cut the suture. *Source:* Photos courtesy of Tom Thompson.

Fig 7 — The same knot on the uterine body. Tightened to blanching, with no crushing clamp applied first. If the uterine body will not exteriorise comfortably, it is acceptable to ligate the two horns separately instead.

The thing worth un-learning You do not need to chase every last millimetre of uterus for fear of stump pyometra. **Pyometra cannot occur without ovarian hormones.** A stump pyometra is evidence of an *ovarian remnant*, not of a generous uterine stump — which should change where you spend your care during the operation.

Phase 5 — closing

Two or three layers, and one of them is carrying the abdomen. The **external rectus fascia is the holding layer**: engage it properly and the pattern barely matters — continuous, interrupted and cruciate are all acceptable. Miss it, and no pattern will save the closure.

Subcutis and skin may be closed separately or as one layer. A **subcuticular** skin closure is preferable simply because it needs no suture-removal appointment, which in shelter and high-volume work may never happen.

If any layer is closed continuously, the **Aberdeen knot** ends it as securely as a square knot with less bulk left in the wound — two throws for a subcuticular or intradermal line, three or four for the linea.

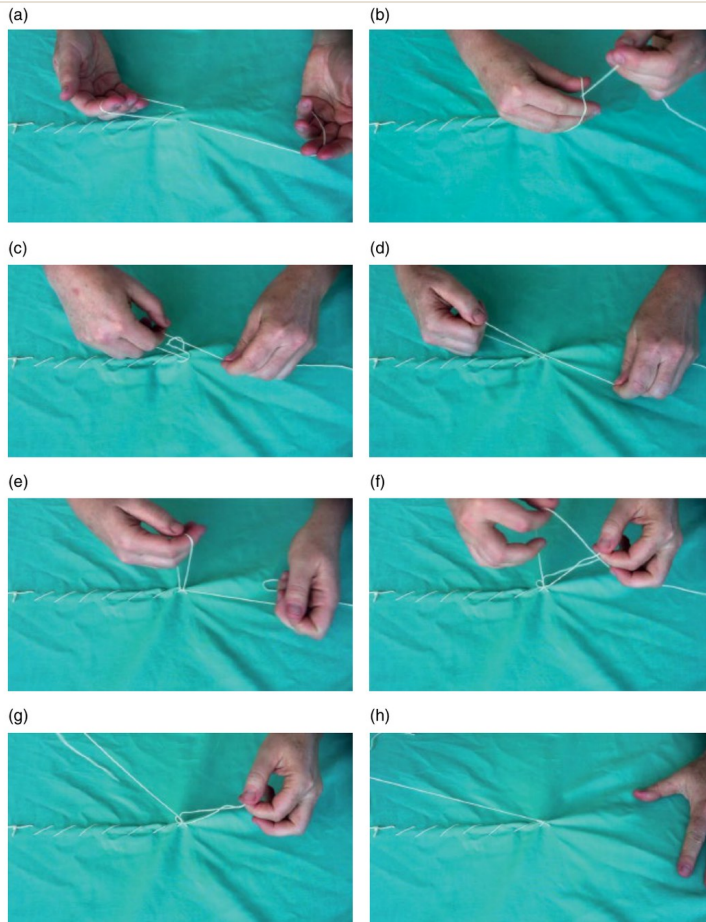


Figure 12.6 An Aberdeen knot. This knot is used at the end of a continuous suture line. It begins with a loop and an end, and can be tied with instruments or as a hand tie. A hand tie is used here for illustration purposes. (a) Pick up the last suture loop. Place the fingers of one hand through the loop while holding the needle end of the suture in the other hand. (b) Reach through the loop and grasp the suture. (c) Pull the suture through without releasing the needle end, thus creating a new loop. (d) Tighten the previous loop until it is flush with the patient. (e) Place the fingers through the new loop and repeat steps b–d at least once more. (f) To finish the knot, on the final loop, release the needle end from the other hand so that the end can be pulled through the loop. (g) Pull the end completely through the final loop. (h) Pull the end until the knot is tightened.

Fig 8 — The Aberdeen knot. Built from the final loop and the free end: reach through, draw a new loop, tighten the previous one, repeat, then pass the end fully through on the last loop. Less bulk than a square knot and easier to bury at the end of a subcuticular line.

06 The modified Miller's knot

A self-locking knot, secure enough that a single one will hold an ovarian pedicle, and usable by hand or with instruments on pedicles, uterine bodies and spermatic cords alike.

Pass the suture under the tissue, bring it back over and under a second time — that leaves a small loop sitting above the tissue. Put the needle holder through that loop, wrap the long strand once around the holder, grasp the short strand, then pull the holder toward you while pulling the long strand away from you. Gentle upward tension as it comes down helps it tighten evenly. Finish with **three or four square throws**.

The point of a self-locking knot It grips as it is tightened rather than relying wholly on the throws above it. That is what makes a single ligature defensible on a pedicle — but only if it is placed on tissue that has not been crushed to the point of tearing, which is the whole reason for the graded clamp pressure two steps earlier.

07 Closure and the holding layer

Two or three layers, and one of them is doing nearly all the work. **The external rectus fascia is the holding layer** — it is the tissue that keeps the abdomen closed, and the reason a closure fails is almost always that this layer was not engaged properly rather than that the wrong pattern was chosen. Continuous, interrupted and cruciate patterns are all acceptable.

Subcutis and skin may be closed separately or as one. A **subcuticular** skin closure is preferable simply because it removes the need for a suture-removal appointment, which in a shelter or high-volume setting may never happen.

If a continuous line is used, an **Aberdeen knot** is a secure and less bulky alternative to a square knot for ending it — two throws for a subcuticular or intradermal line, three or four for the linea.

08 The flank approach

Ventral midline is standard in the United States; a flank incision is preferred in much of Europe, and there are specific cases where it is clearly the better choice: **lactating bitches and queens**, and patients with mammary hyperplasia, because it avoids cutting through mammary tissue and keeps the incision away from nursing offspring. It also dehisces less often than a midline, which matters in trap–neuter–return work where the patient is released quickly.

The trade-offs are real. It is harder in large, deep-bodied or obese patients, it is **not recommended for pregnancy or pyometra** because exposure is limited, and — the one that should decide it for an inexperienced surgeon — **a dropped pedicle is far harder to retrieve, and unexpected haemorrhage far harder to control, through a flank incision.**

09 Complications, and the errors behind them

Each of these is a technical step revisited from the other end.

COMPLICATION	THE TECHNICAL ERROR BEHIND IT	HOW TO AVOID IT
Pedicle haemorrhage the one that kills	Knot placement, spacing or tightness — compounded by a fat-laden pedicle that lets a ligature slip, or by a pedicle torn during handling	Ligature several millimetres clear of any crushing instrument; graded clamp closure so the proximal pedicle is never crushed through; and look at every stump before it goes back in
Ovarian remnant syndrome more often the right side	Ovarian tissue incompletely excised, or a dropped fragment that revascularises. The right ovary is over-represented, because its more cranial position makes it harder to exteriorise fully	Break the suspensory ligament down properly so the ovary genuinely reaches the incision, and inspect each excised ovary to confirm it is complete before releasing the pedicle
Stump pyometra	Ovarian tissue left behind — not uterine tissue left behind	Pyometra cannot occur without ovarian hormones. Chasing the last millimetre of uterus is not the safeguard; complete ovarian removal is
Dropped pedicle	A clamp released before the stump was checked, or a stump lost under tension	Extend the incision rather than fight for exposure. A flank approach in particular gives poor access for retrieving a dropped pedicle or controlling unexpected haemorrhage

Post-operative analgesia is part of the operation rather than an afterthought — see our NSAIDs in dogs and cats guide for dosing and the contraindications that matter in a surgical patient, and our fluid therapy guide for why perfusion is what you are defending if a pedicle does bleed.

10 If the pedicle bleeds

Prevention has its own section above. This is what to do when prevention has already failed, because that is the moment a student most needs a plan rather than a principle.

Do not chase it blindly. Grabbing at a bleeding field with a hemostat is how ureters, bowel and the caudal vena cava get clamped. Pack the area with a swab, apply pressure, and take the few seconds that buys you to do two things: **extend the incision** and get proper light and suction or swabs into the abdomen. Exposure is the treatment; almost nobody regrets extending a spay incision.

Then find it deliberately. A retracted ovarian pedicle sits dorsally, near the **caudal pole of the kidney** on that side — the kidney is your landmark, not the blood. Follow the body wall dorsally, identify the kidney, and work along the pedicle's path toward it. Identify the structure clearly before any clamp closes, and re-ligate under direct vision.

Know the numbers while you work. Canine blood volume is about **90 ml/kg** (feline about 50 ml/kg). A patient with a normal pre-operative PCV can generally lose around **20% of blood volume** without needing a transfusion, and that much is usually replaceable with crystalloid. In a 5 kg bitch, 20% is about 90 ml — which is a startlingly small volume on a drape, and the reason haemorrhage is far more dangerous in small patients than the same visual loss suggests. Tell the anaesthetist immediately; they cannot respond to what they have not been told.

The judgement call If you cannot see it, you cannot fix it. Converting to a longer incision, or asking for a second pair of hands, is a better decision than continuing to work in a field you cannot visualise. This is also precisely why the flank approach is a poor choice for an inexperienced surgeon — retrieving a dropped pedicle through it is markedly harder.

11 When she is not a routine case

Three variations a student will meet early and should not meet unprepared.

In season, or recently in season. The whole tract is engorged, the pedicles are fatter and far more vascular, and the tissue is friable. Nothing about the technique changes; everything about the margin for error does. Work slower, take a more generous incision, and be more careful than usual to keep ligatures clear of crushed tissue.

Pregnant. The uterus is heavy, the vessels are large, and exteriorising it without tearing needs a longer incision placed more cranially. This is not a flank-approach case.

Obese. Fat obscures every landmark, and a fat-laden ovarian pedicle is the specific situation in which a ligature is most likely to slip — the reason a pedicle tie is appropriate in cats but **not** in dogs. Take the time to isolate vessels within the fat rather than ligating a bundle you have not identified.

12 After the operation

Before you close, do a deliberate check: both ovaries inspected and confirmed complete, both pedicles and the uterine stump viewed for haemorrhage, swab count correct, and no instrument left in the abdomen.

Recovery. Monitor temperature, pulse, respiration and mucous membranes through recovery — delayed intra-abdominal haemorrhage presents as a patient who is unexpectedly quiet, tachycardic and pale rather than as visible blood, and the abdomen may be the last place anyone looks. Continue analgesia; a spay is a coeliotomy, not a minor procedure, whatever its routine status suggests.

Discharge advice. Exercise restriction and lead walks only for the period your practice specifies, a buster collar or body suit to stop her interfering with the wound, and clear instructions on what should prompt a call back: swelling, discharge, a wound that opens, inappetence, lethargy or vomiting. If a subcuticular closure was used, say so explicitly — owners who expect a suture-removal appointment and are not given one often assume something has been forgotten.

The follow-up that matters most A bitch who shows **oestrous behaviour weeks or months later** has an ovarian remnant until proven otherwise, and that is a surgical, not a hormonal, diagnosis. It is worth recording at the time of surgery which side was more difficult — usually the right — because that is the side you will be exploring.

13 Canine spay — frequently asked questions

Where exactly should the spay incision go in a dog?

On the ventral midline, and the level depends on age because it depends on what is hardest to reach. In an **adult bitch** the ovaries are the difficulty, so the incision sits **just caudal to the umbilicus**. In a **puppy under five months** the uterine body is the difficulty, so it moves further caudal, just cranial to the midpoint between umbilicus and pubis. A 1–3 cm skin incision is enough for a routine spay; length is a poor substitute for correct placement.

How many ligatures does an ovarian pedicle need?

One, provided it is placed and tied properly. Students are widely taught to double-ligate, but a single securely tied ligature — a modified Miller's knot, sited several millimetres clear of any crushing instrument and dropped into the groove left by the proximal clamp — is sufficient. What causes pedicle haemorrhage is not the number of ligatures but their placement, spacing and tightness, particularly on a fat-laden pedicle.

Should you ligate the pedicle before or after transecting it?

Transect first, then ligate. It is the opposite of what is commonly taught, and the reasoning is practical: transecting first gives far better visibility and needs much less manipulation of the pedicle, which reduces both the chance of tearing it and the chance of including tissue in the ligature that should not be there.

What causes ovarian remnant syndrome, and why is it usually the right side?

Ovarian tissue that was not completely excised, or a fragment that was dropped and revascularised. It is **more common on the right** for a purely anatomical reason: the right ovary lies further cranial, which makes it harder to bring fully out of the incision, so it is more often removed incompletely. The defence is to break the suspensory ligament down properly rather than working at the limit of your reach, and to **look at each ovary you have removed** and confirm it is whole before you release the pedicle.

Can a spayed dog still get a stump pyometra?

Only if ovarian tissue remains. **Pyometra cannot occur without ovarian hormones**, which is why it is not necessary to chase every last millimetre of uterine tissue during an ovariohysterectomy — and why a stump pyometra should be read as evidence of an ovarian remnant rather than of too much uterus left behind.

Is ovariectomy as safe as ovariohysterectomy in dogs?

For a **healthy** bitch, the comparative evidence says yes and in several respects better — a smaller incision, less surgical trauma, less pain and no demonstrated difference in later pyometra or urinary incontinence. Ovariohysterectomy remains the correct operation when the uterus itself is diseased. The honest caveat is that ovariectomy's advantages in time and incision size are *not* seen when the surgeon is inexperienced with it.

Why should you not tie a dog's forelimbs forward for a spay?

Because it makes the hardest part of the operation harder. Pulling the forelimbs cranially and securing them there — which is routinely taught — **increases tension on the ovarian suspensory ligaments**, so the ovaries become more difficult to exteriorise. Securing the forelimbs along the thoracic wall, or leaving them untied, avoids it.

When to refer

- **Incision** — adult: caudal to umbilicus. Puppy: further caudal. 1–3 cm.
- **Forelimbs** — along the chest, not tied forward.
- **Spay hook** — right wall, sweep medial, elevate. Mind the spleen on the left.
- **Traction on the proper ligament** tensions the suspensory ligament so you can find it.
- **Clamps** — one, two, three clicks. Never crush the proximal pedicle through.
- **Transect, then ligate**. One modified Miller's knot, clear of the clamp.
- **Remove the proximal clamp before tightening** so the knot sits in the crushed groove.
- **Watch every stump** before it returns to the abdomen.
- **Uterine body** — tighten to blanching, do not crush, leave a stump beyond the ligature.
- **Closure** — external rectus fascia is the holding layer. Subcuticular skin.
- **Stump pyometra is an ovarian problem**, not a uterine one.

Sources

1. Bushby P, White S. *Dog Spay/Cat Spay*, in *High-Quality, High-Volume Spay and Neuter and Other Shelter Surgeries* — the operative sequence followed throughout: forelimb positioning and suspensory-ligament tension, incision placement by age, midline and paramedian entry, spay-hook technique, the one-two-three click clamp sequence, transection before ligation, the single ligature and modified Miller's knot, uterine-body ligation to blanching, the holding layer and the Aberdeen knot, and the flank approach with its indications and limits.
2. *Current Techniques in Small Animal Surgery*, 5th ed. — consulted for the surgical approach and instrumentation context.
3. Comparative literature on **ovariectomy versus ovariohysterectomy** (JAVMA and the associated surgical reviews) — for the equivalence of long-term urogenital outcomes including pyometra and urinary incontinence, the reduced trauma of ovariectomy, and the finding that its time and incision advantages do not hold for inexperienced surgeons. Attributed as comparative evidence rather than to the two operative texts above.
4. Ovarian remnant syndrome literature — for the right-sided predominance and its anatomical explanation.

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