

Canine Ovariohysterectomy

Tips & tricks and how to avoid potential complications.

Before We Start...

Think about the breed of dog you're operating on. They are not all the same!
e.g. Greyhounds are different in several ways:

1. They have very thin skin – so, care with the depth of your incision.
2. They have very little s/c tissue. Therefore don't waste time dissecting it.
3. They are deep chested and long bodied – you will need a longer incision.
4. They are very muscular – and the linea alba often very narrow - care required.
5. They have very strong suspensory ligaments – which seem deep due to the deep chest.
6. They have excellent cardiovascular systems – so, pay attention to haemostasis.
7. They frequently have very immature repro tracts – often smaller than a cat!

The Most Common Errors:

- Failure to Drape properly – use all the drapes – plain and fenestrated, remember to allow for a long incision.
- Don't contaminate your gloves while draping! Make sure your fingers don't touch the dog.
- Always use both blades appropriately. One for skin alone – and one for all sterile internal work.
- Never handle the blades in your gloved hands. Insert them onto the handles with the needle driver.
- Always moisten your swabs before use in the saline provided. And 'dab' tissue - don't wipe!
- Know your instruments names and how to use them properly – especially the different scissors!
- Employ curved instruments correctly – pointing up or toward you so you can see the points.
- Gentle pressure when incising skin to avoid inadvertently entering the rectus muscle.
- Never place Allis tissue forceps onto the skin to act as retractors!
- Be Atraumatic! Don't over-handle tissues, (be less fussy!) and try to be efficient.
- Know the '3-Clamp Ligation technique' – alternatively the 'Modified 3-Clamp Ligation technique'
- Tie secure knots – never < 4 throws and leave tags never < 4mm long.
- Don't include XS muscle or s/c tissue in your L.A. closure – you only need the External Rectus Sheath (ERS)!
- Don't confuse the subcutis with the ERS and close it instead!
- Try to master the buried knot in your subcuticular closure.
- Tie 'flat' knots – not 'granny knots'; and never 'slip knots'.
- Skin sutures must be loose to accommodate post-op oedema!

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The skin incision:

Before cutting – please think carefully about how big, and where you want your incision to be!

To maximise visibility and allow precise regulation of your cut, use your non-dominant hand to apply tension across the wound site and then cut with a smooth firm pressure.

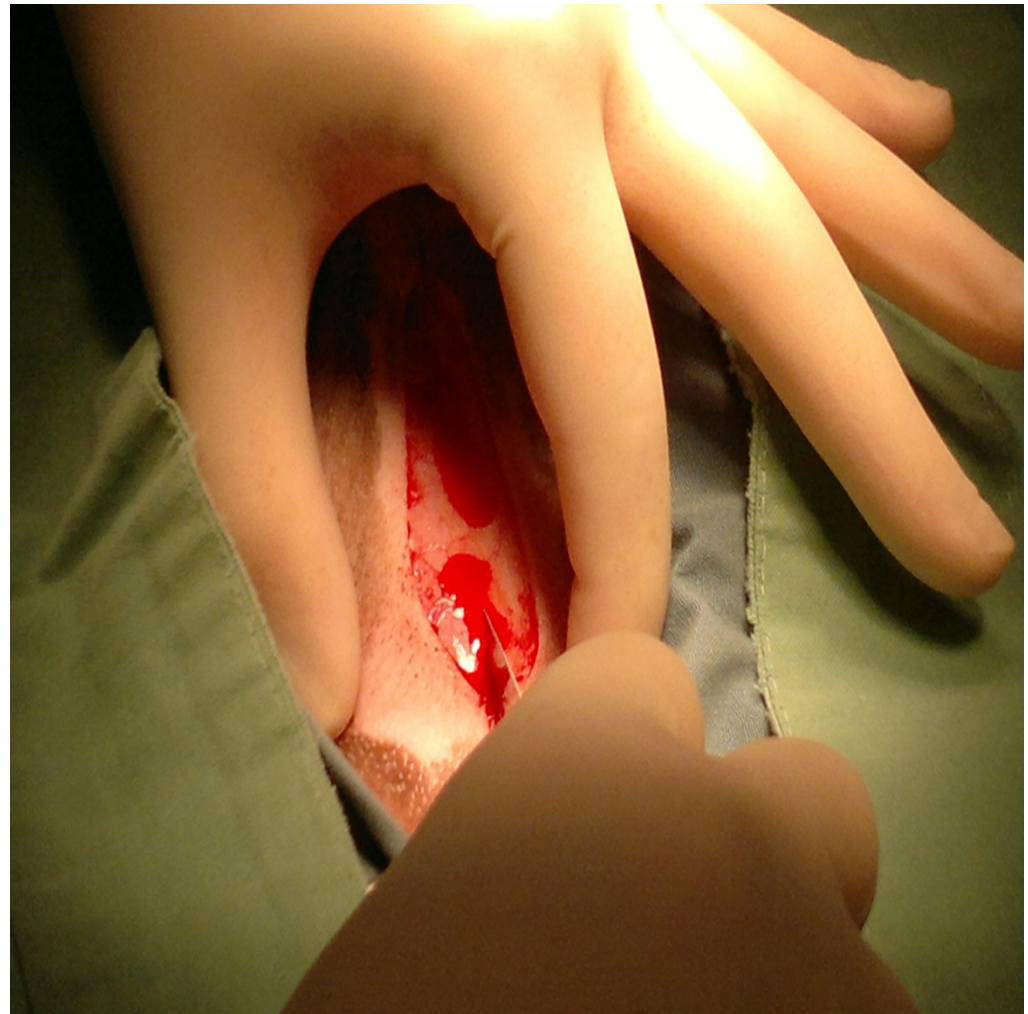
Change blades once the skin incision is done.

**Halsted's Principle: Employ aseptic technique*

Control the depth of your cut to reach the linea alba (L.A.) with as few cuts as practical.

Avoid multiple small lacerations!

Sharp dissection is preferred to reduce potential trauma and dead space.



Finger tension across the incision gives improved visibility and greater control to the surgeon

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Most skin bleeders will be controlled by pressure alone – but muscle bleeders may require more:

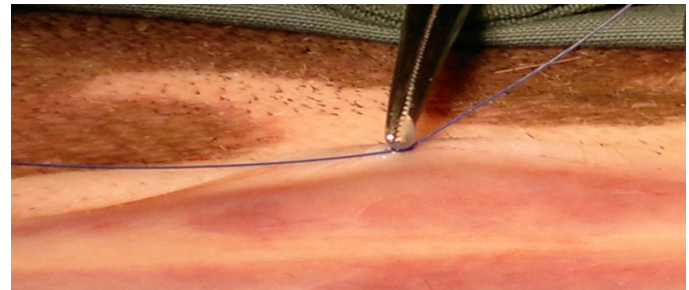
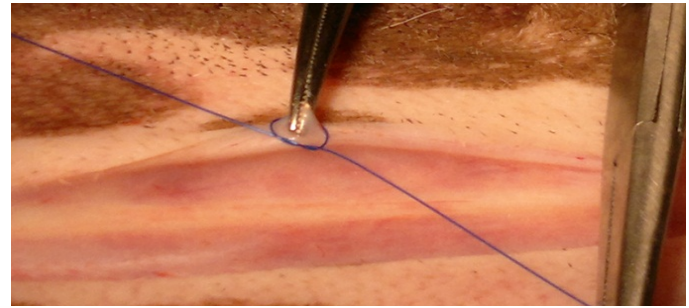
Judicious use of the tips of the mosquito forceps to control superficial bleeders at this stage will improve visibility during the procedure.

**Halstedian principle: Ensure accurate effective haemostasis!*

If you don't have cautery available you may need to ligate persistent bleeders with 3 or 4/0 MFA placed below the tips of the haemostat and tied with one square knot.

Please note as we start this spey overview – how absolutely vital Halsted's Principles are in everything we do!

Applying these principles is fundamental to achieving high standards!

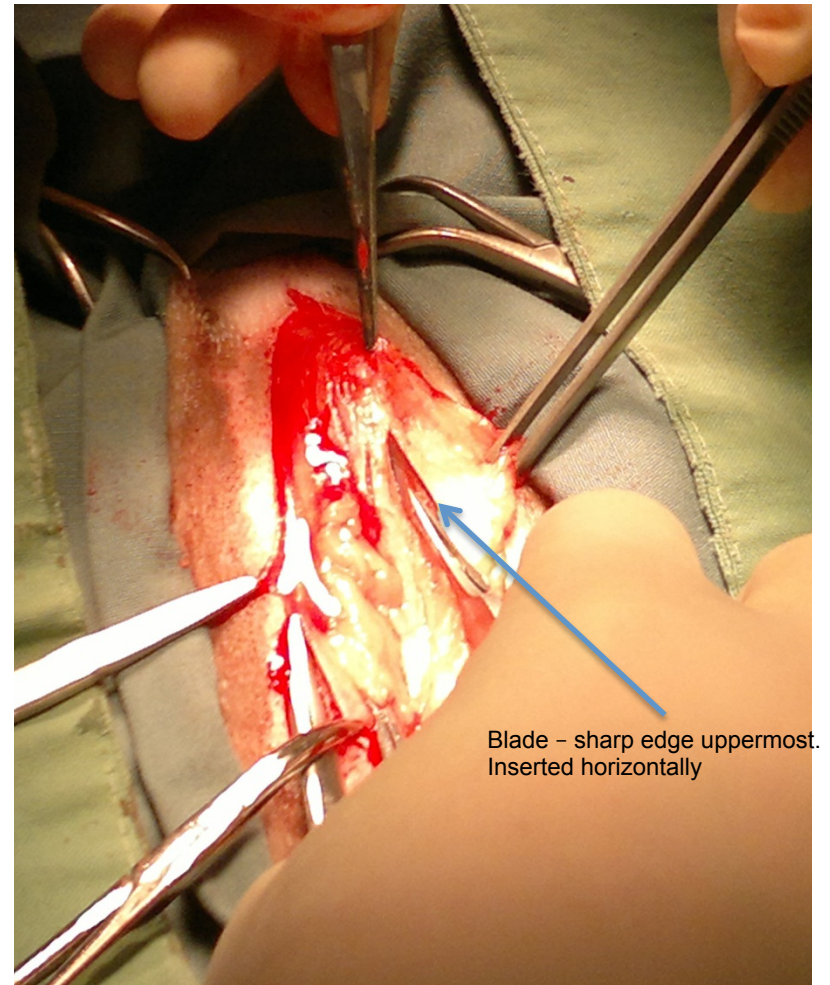


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Make your stab incision into the abdominal cavity through the L.A. close to the umbilicus – where you know the underlying falciform ligament can act as a protective cushion between the blade and the abdominal organs below.

Reduce risk to the spleen further by holding the blade horizontally and with the sharp edge uppermost, then enter an elevated “tent” created by using forceps to lift the L.A.

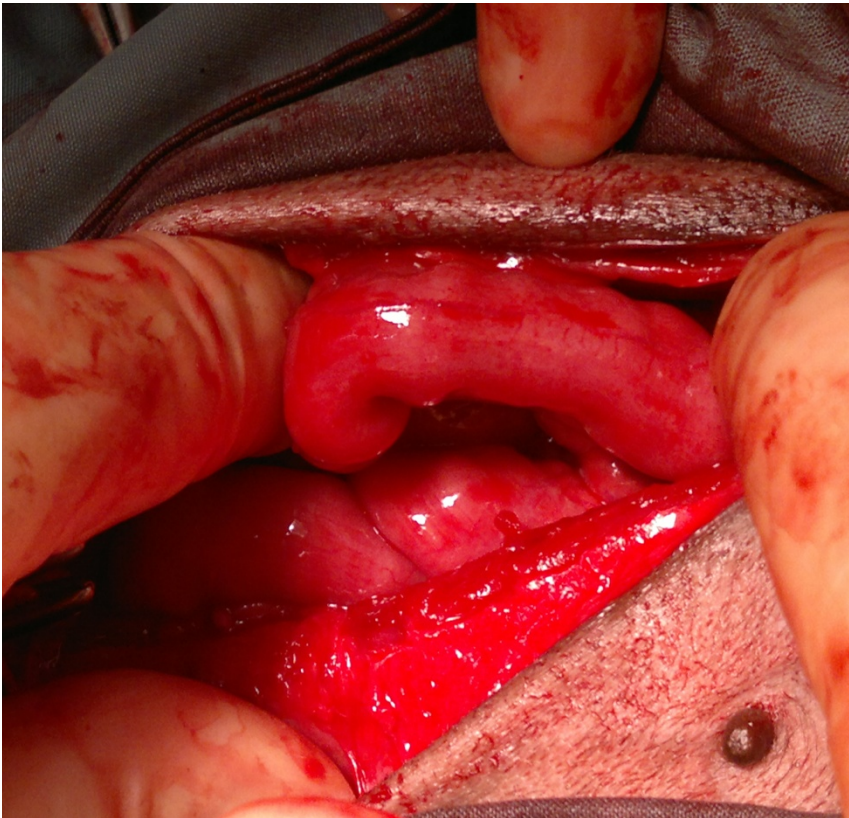
Make this incision big enough to insert your index finger.



Note correct use of mosquito haemostats – using the tips only

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Alternatively, gently probe with a blunt instrument to check if you are now intra-abdominal or not. and extend with Mayo's just enough to allow you introduce one finger to check for adhesions. Then extend the full length of the skin incision.



Note the firm adhesion between an underlying loop of jejunum and the linea alba. This student was very lucky that the initial stab incision did not penetrate the intestine! A clue to this possibility is where you see an abdominal scar from previous surgery!

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Occasionally your midline incision is off centre. Instead of entering the abdomen through the L.A. you enter the body of the rectus abdominus muscle by going through the external rectus sheath!.

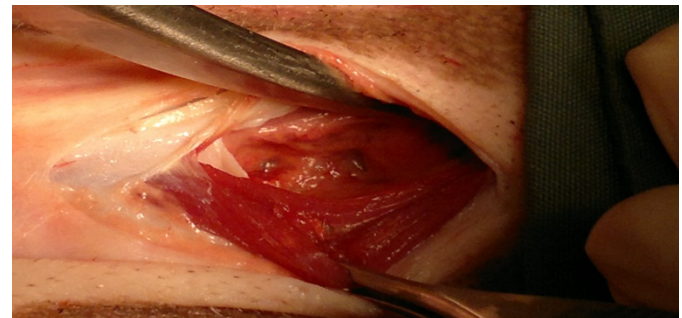
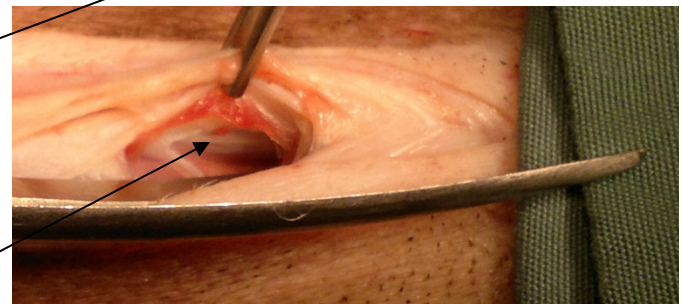
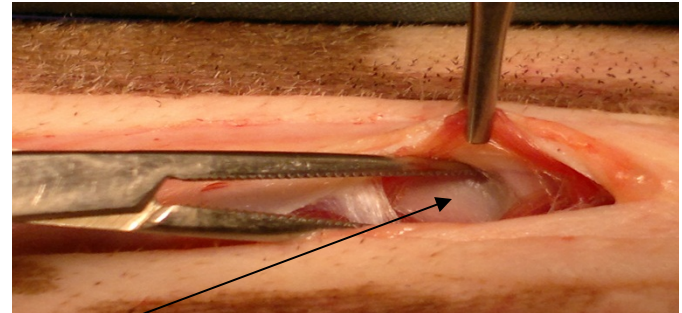
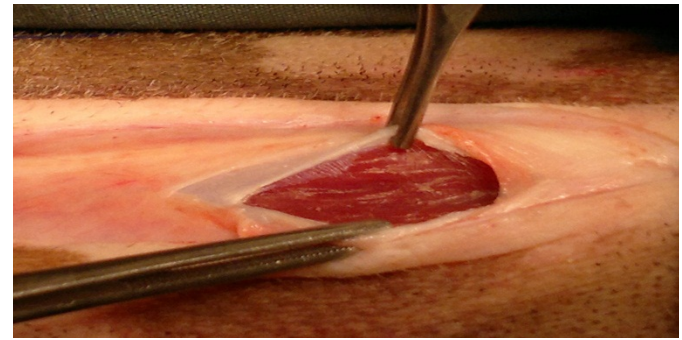
This can be quite confusing!

When you try to extend you realise that you're not in the abdomen at all – you're between the internal and external sheaths of rectus abdominus.

Estimate which side of the L.A. you are, Right or Left – then Dissect carefully toward the L.A. to reveal the medial surface of the internal sheath. It appears pale and smooth cf to the red vascular tissue of the abdominus rectus muscle.

Now make a small incision in the internal sheath near the L.A. and verify by gently probing that you are finally through to the abdominal cavity.

Insert the lower blade of your Mayo's and extend your incision while steering back onto the L.A.

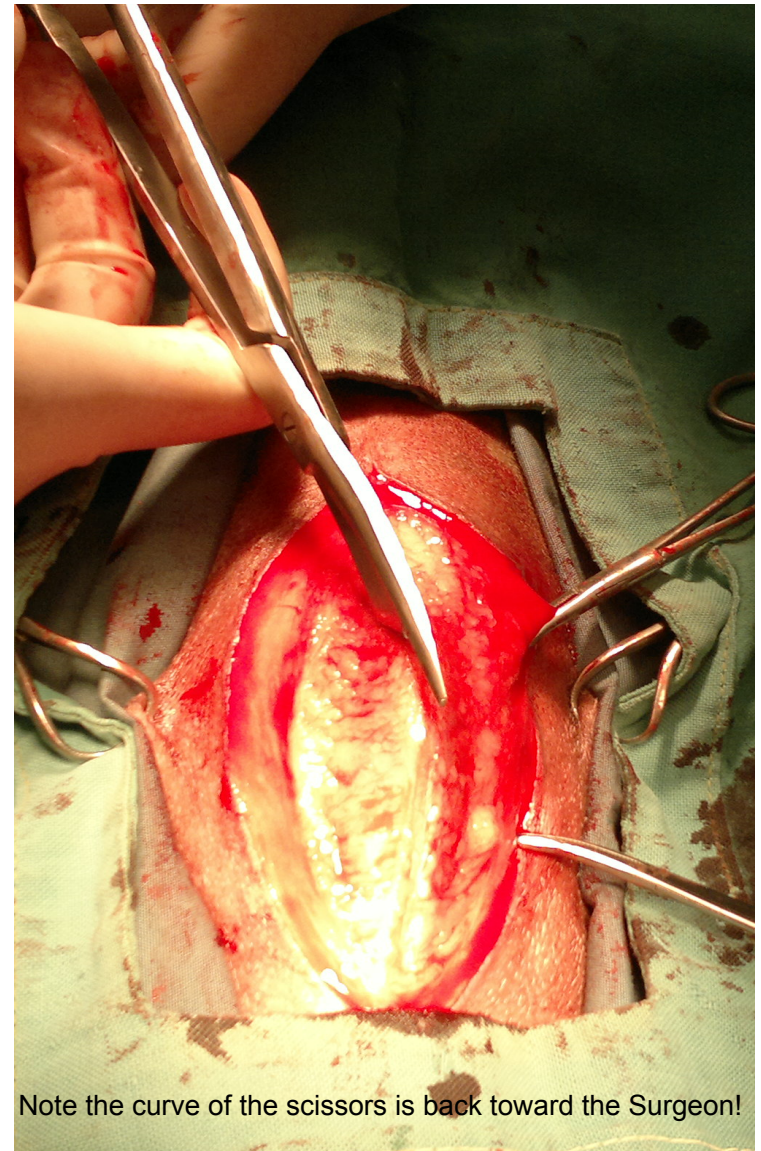


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Using Mayo scissors extend cranially and caudally. NEVER use Metzenbaums for this task – they are precision dissecting scissors and will be quickly dulled by the coarse connective tissue.

Note how the surgeon is continuing to elevate the linea alba away from underlying organs with the lower blade of the Mayo's while extending the incision caudally.

The incision length is not critical. However – give yourself enough room to operate comfortably without having to apply undue traction on the cranial and caudal reproductive tract. This causes unwanted tissue trauma and can slow healing & recovery.



Note the curve of the scissors is back toward the Surgeon!

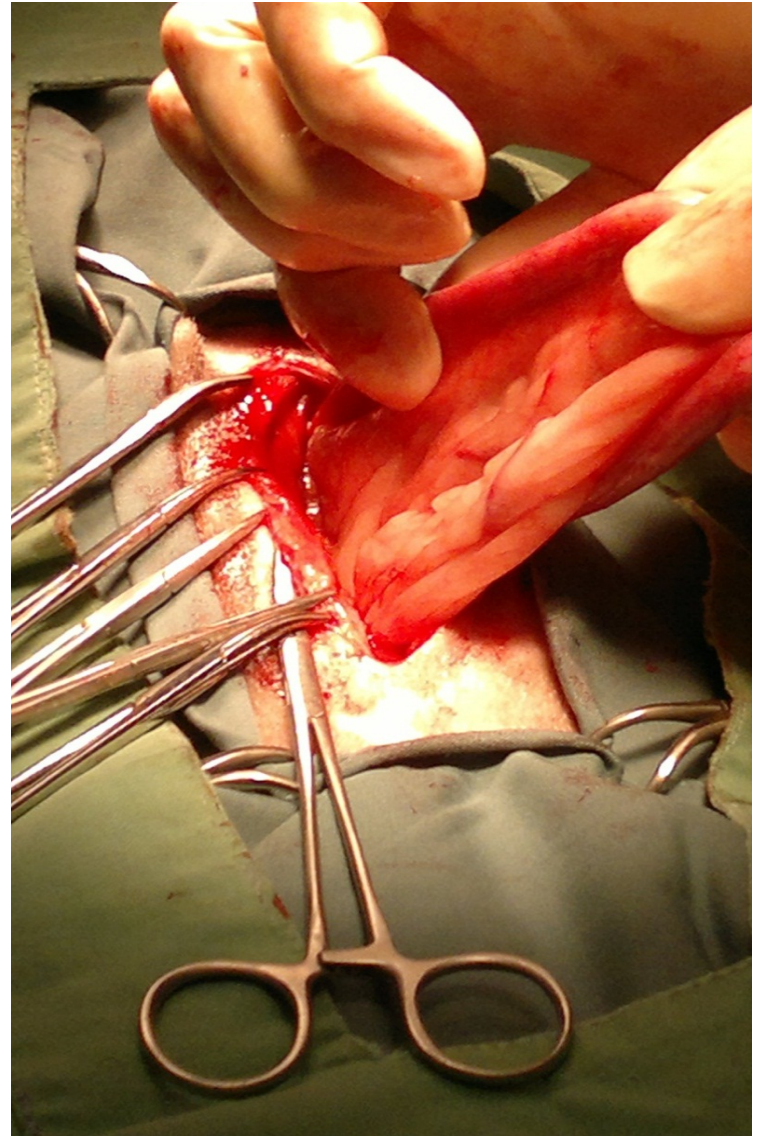
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Look before you leap! Spend a moment looking into the abdomen – just make sure all looks normal – sometimes the uterine horn is sitting right there looking at you! At other times you will need to search down the lateral abdominal walls toward the paralumbar gutters

Alternatively, locate the uterus and broad lig. under the bladder adjacent to the distal colon.

Once the horn is exteriorised the surgeon must now exteriorise the ovarian pedicle so that a ligature can be applied. This is not always easy due to the strong ovarian suspensory ligament .

There are many methods described to achieve this – I shall describe one that I consider easy and safe, however you must choose the one that works for you.



The broad ligament often contains abundant “pale” fat deposits which aid in its identification

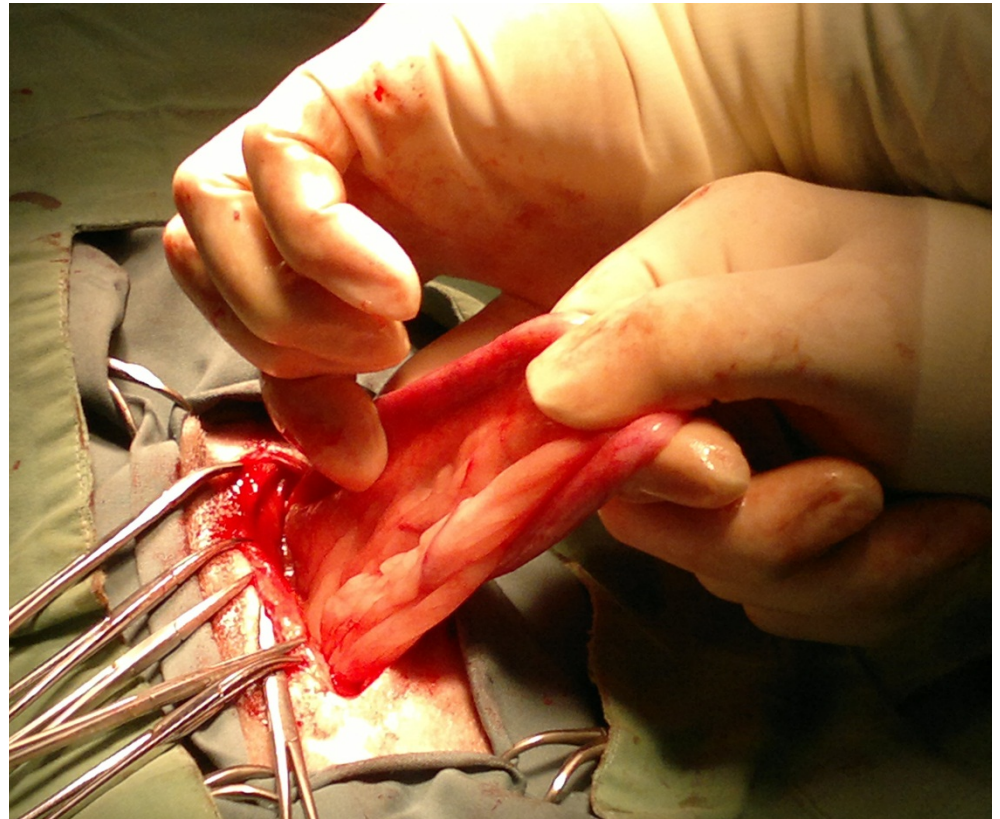
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A Simple Caudal Traction Technique:

A useful technique to assist you to grasp and exteriorise the ovary is to apply gentle caudal traction with one hand holding the uterine horn, then running the index finger and thumb of the other hand down the uterine horn toward the ovary.

I do this with a crossed hand method.

Allow your finger and thumb to then slide over the ovary and grasp the taut suspensory ligament as cranially as affords a good grip. Now lock your hands up against one another while simultaneously pressing down onto the abdominal skin and applying caudal traction with both hands – one hand cranial to the ovary and one holding the uterine horn.



The surgeon is holding the uterine horn in the Rt hand and the proper lig of the ovary in the Left. With persistent and steady gentle caudal traction the suspensory ligament will stretch allowing the left hand to slide cranial to the ovary and grip the suspensory ligament. Now the left hand can apply even greater caudal traction force to rupture or stretch the ligament. NB. The photo seems to show the surgeon applying upwards traction – this was only to show the positions of the hands – pull caudally only!

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The ligament will frequently stretch before rupturing. Sometimes the stretched lig. allows sufficient exteriorisation of the pedicle to permit ligation without having to rupture it. That is perfectly acceptable.

Whichever method you choose to employ to break the ligament – it is essential that you do not traumatise the ovarian pedicle!

Ovarian pedicles are fragile and if damaged they can weaken and literally “melt” away with even the gentlest traction while you are trying to ligate them!

****Beware the dog with any of the following risk factors:***

Obese, mature, in season, pregnant or a hx of reproductive health issues.

The pedicle may be especially friable – and experienced surgeons learn to take extra care with these!



The finger and thumb grip on the suspensory ligament is still within the abdominal cavity and applying steady persistent caudal traction – keep going – it will rupture!

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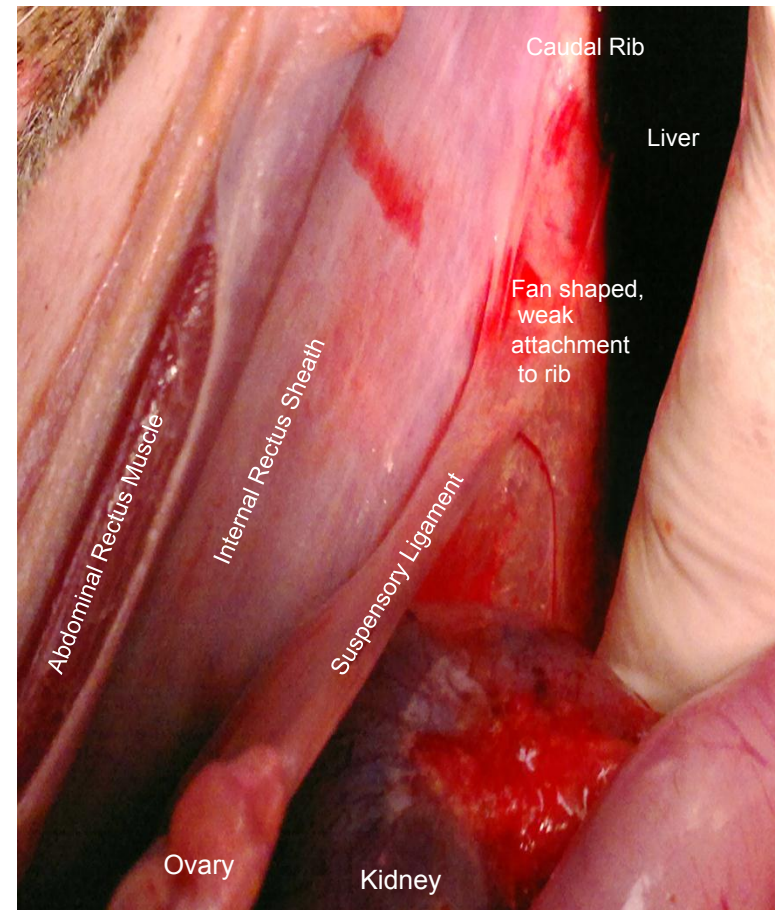
It is important to note that in this caudal traction method there are some rules to observe:

Understand the surgical anatomy! The pedicle and the suspensory ligament are at right angles to each other. One comes from the caudal ribs – and one from the renal fascia.

Therefore never pull directly away from the kidney – you will be stretching and traumatising the delicate pedicle and renal fascia – not the suspensory ligament!

Direct your tension caudally – directly opposite from the origin of the suspensory ligament. By this means it will be the ligament that ruptures – not the pedicle!

Some surgeons direct their index finger cranially along the lateral edge of the suspensory ligament close to the costal attachment – then direct a force medially. This not only ruptures the ligament well away from the delicate pedicle and its associated vessels, but this is where it is weakest – at its fan shaped insertion on the rib.

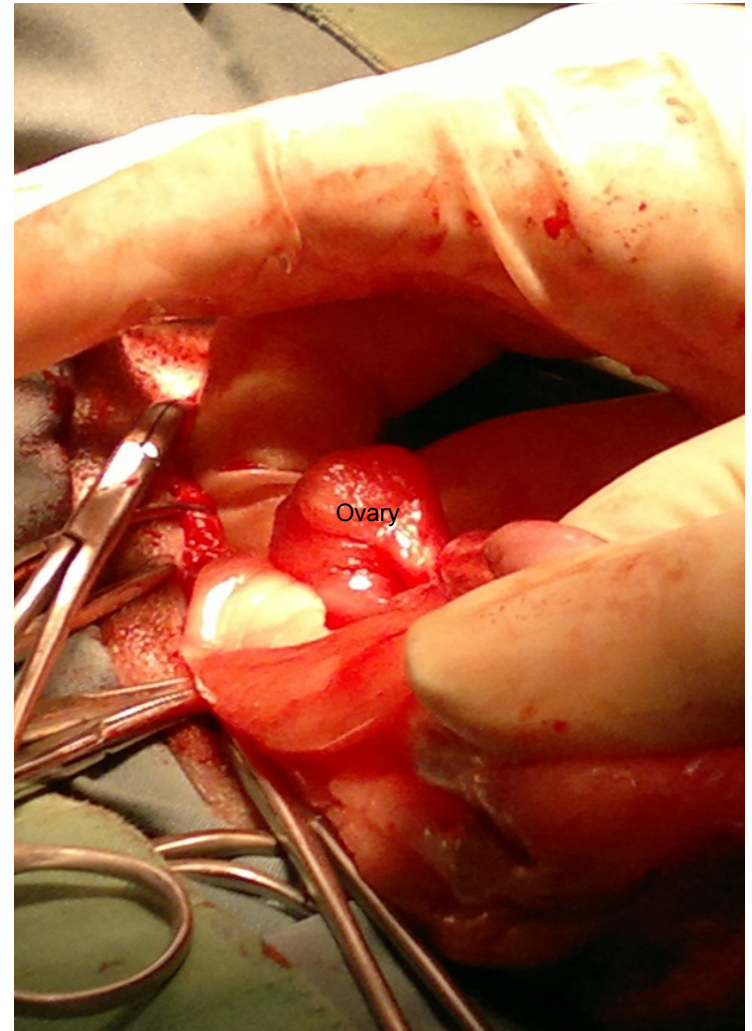


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Be prepared for a ligament that ruptures suddenly! Keep your hands firmly pressed against the abdominal wall as you pull caudally – thus friction between your hand and the wall “brakes” any sudden recoil. And by keeping close to the body wall you ensure that your pull is truly caudal – without a vertical component!

Once you obtain a good grip on the suspensory lig. (do not include the pedicle!) do not keep on adjusting your grip. Every time you re-grip the tissues trauma is occurring. The adjacent pedicle will only stand so much of this trauma before tearing!

Once the suspensory ligament has ruptured – the unprotected pedicle is vulnerable - treat it gently!



The suspensory ligament has now ruptured allowing the surgeon's hands to move caudally – bringing the ovary into view. The same grip was maintained throughout, and ligation is now possible.

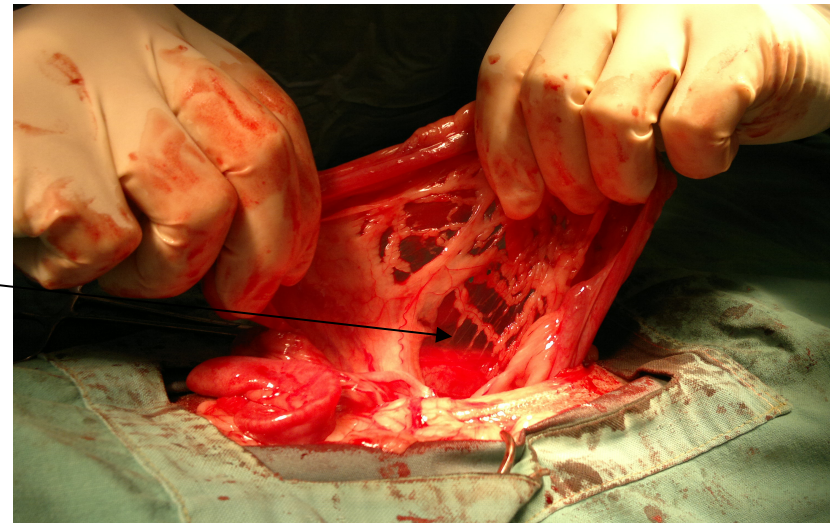
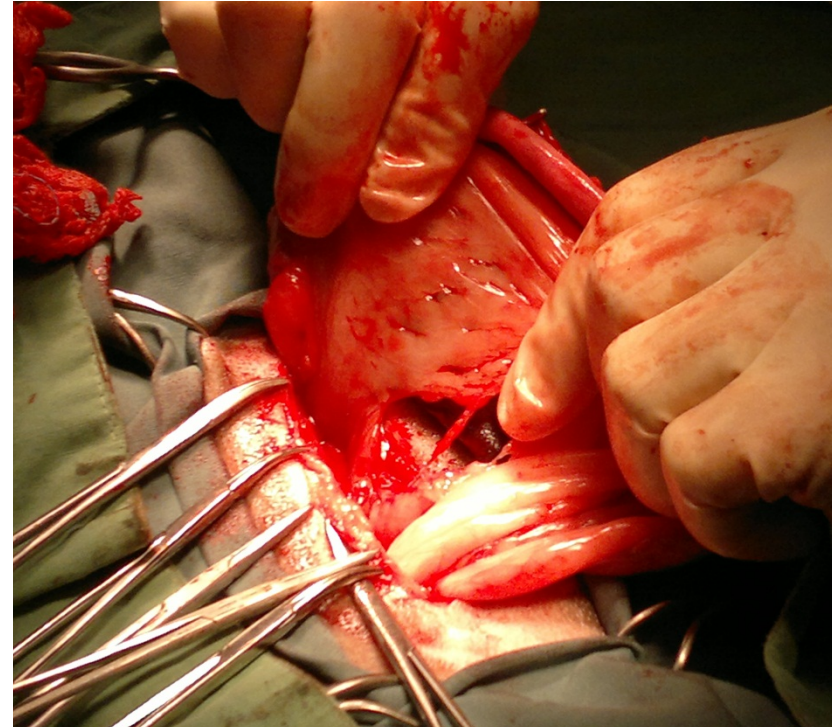
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Before ligating the pedicle it must be isolated from the Broad Ligament – great care is required to be sure to identify the “transparent window” which is then bluntly entered.

It is possible to find an area of transparency (an area devoid of vessels and fat deposits) within the pedicle itself in some dogs. If the surgeon develops that with blunt dissection instead of the correct one – there will be ovarian blood vessels left in the broad ligament.

And remember – you are going to bluntly transect the broad ligament in due course.

So be sure to check there are no blood vessels remaining caudal or below your proposed window.



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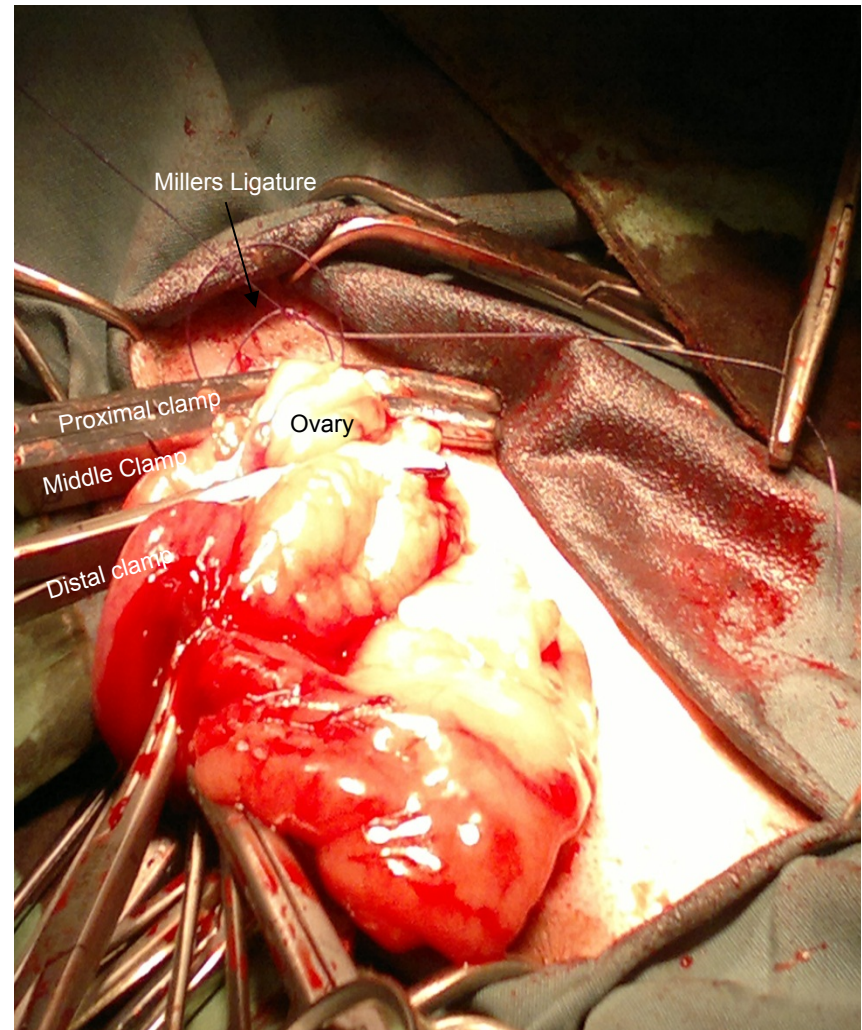
Here 3 clamps have been applied, 2 proximal to the ovary and one distal – across the proper ligament. Ensure your middle clamp (the one nearest the ovary) is not touching the ovary! If it is there is a risk that ovarian tissue might be seeded into the abdomen, or remain on the pedicle stump following transection!

The result would be ongoing oestrus cycles and a risk of stump pyometra!

A Miller's ligature is being placed. Note the 2 loops of suture around the pedicle.

This will lie in the crushed tissue left in the pedicle when the most proximal clamp is removed.

The Miller's ligature is a very strong and secure ligature which is used when extra security is needed – typically around large pedicles and enlarged or turgid uterine bodies.



*Because the Millers ligature involves 2 loops the force applied when tightening the ligature is actually doubled within the ligature loop due to a pulley effect.

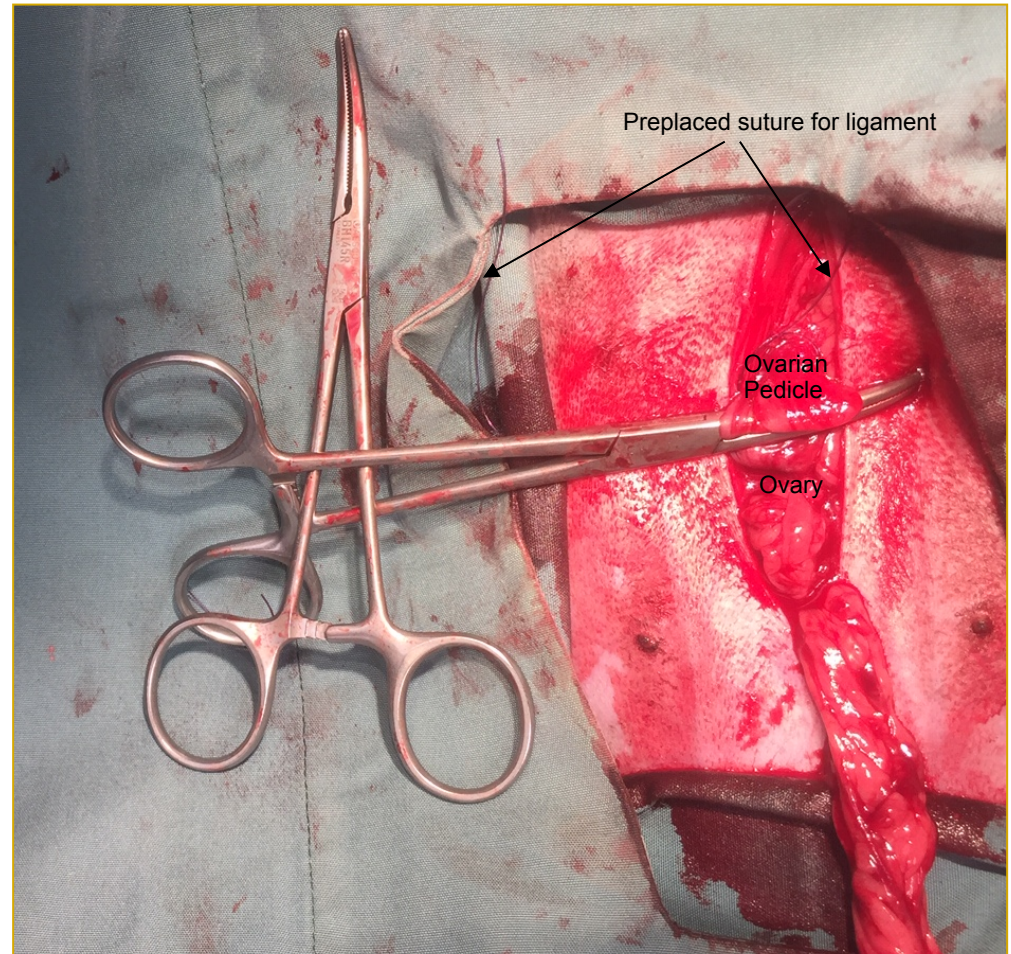
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A simple trick which allows you a hands-free method of securing the ovary and its pedicle in position ready for ligation:

Having managed to get 2 clamps onto the pedicle the surgeon has now removed the most proximal one (leaving a 'crush' with a loose ligature) and transferred it to secure the handles of the remaining clamp.

Simply roll the remaining (middle) pedicle clamp over and slide the first clamp between the handles to secure it.

Remove the clamp from the handles and place it on the proper ligament distal to the ovary once the ligatures are tied and before pedicle transection.



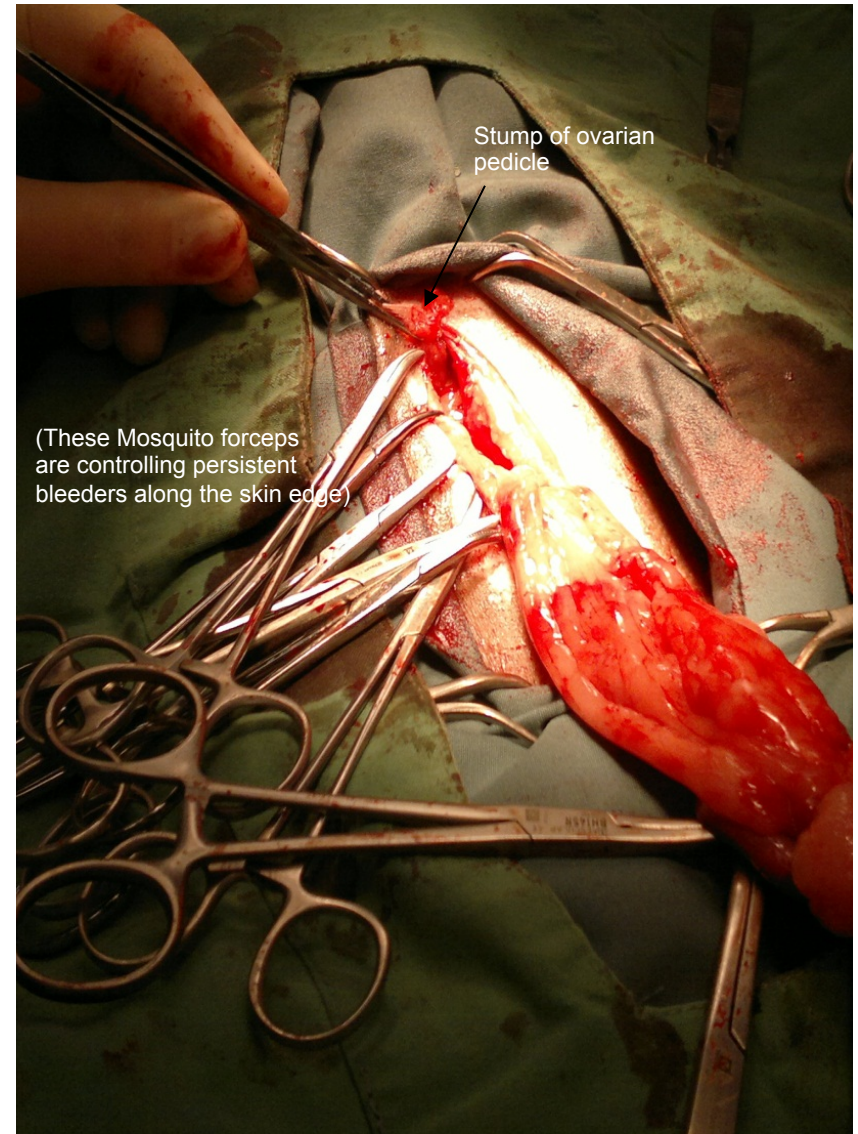
The method of using just 2 clamps instead of 3 is sometimes referred to as a "Modified Three Clamp Technique". 3 clamps are still used – but now the most proximal will also serve as the most distal in turn.

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Inspect the pedicle stump for haemostasis before finally releasing it gently back into the abdomen.

Do not hold the ligature itself as you risk dislodging it.

In this dog the right Ovary was dealt with first. For less experienced surgeons I would always recommend you do the left one first. The reason is simple- its easier! And will give you a good indication of what you're up against – if it is difficult – then you're forewarned that the right one will be harder. And that might prompt you to extend your incision a bit before tackling it!



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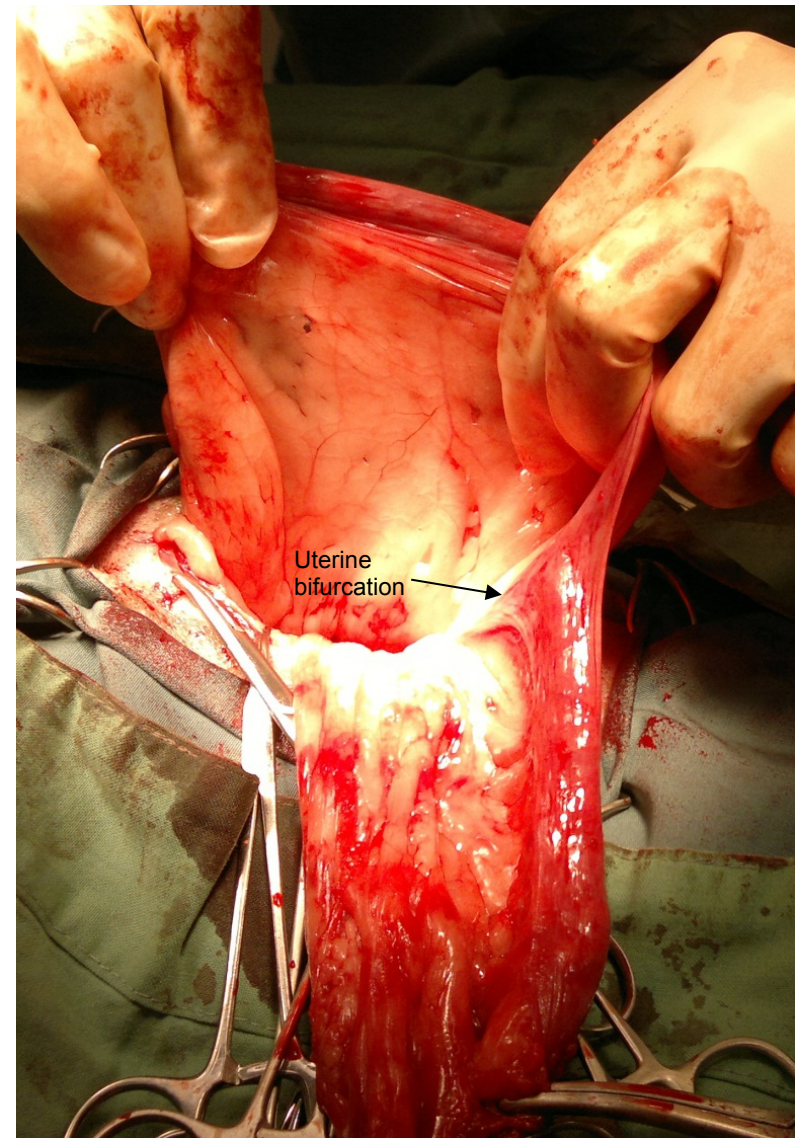
By simply following the right uterine horn caudally and then cranially back up the left horn the process can now be repeated for the left ovary.

Occasionally in an animal with a full bladder the horn appears to dip under the neck of the bladder and can confuse.

This occurs with the dog in dorsal recumbency as the heavy bladder displaces towards the dogs (or cats) dorsum – thereby entrapping the uterus.

Slide your finger along the lateral border of the horn beneath the bladder to release it – alternatively elevate or exteriorise the bladder and the horn can be lifted free.

Similarly – the intestines can also occasionally entrap the uterine horns by looping over them. Gently retract them and lift the horn clear.



In this picture the transparent window is just coming into view at the level of the incision. Check that all significant vessels are cranial to it.

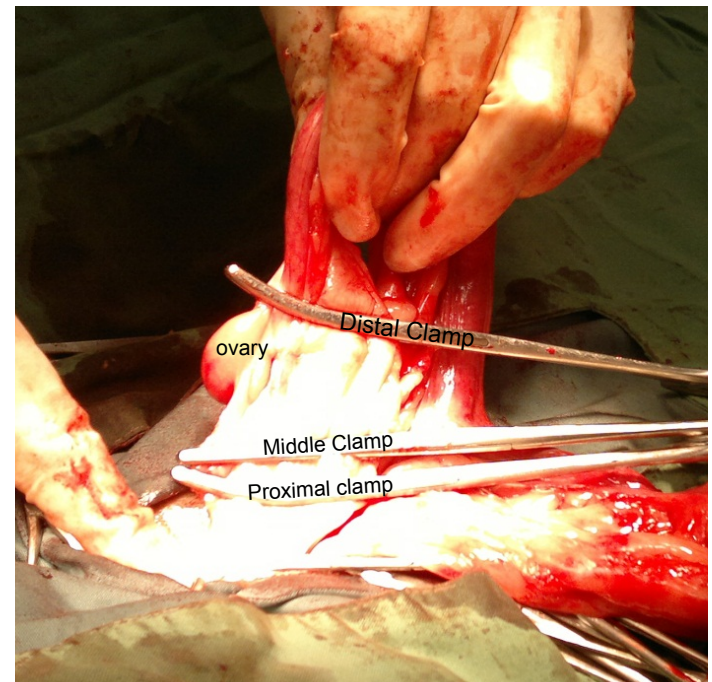
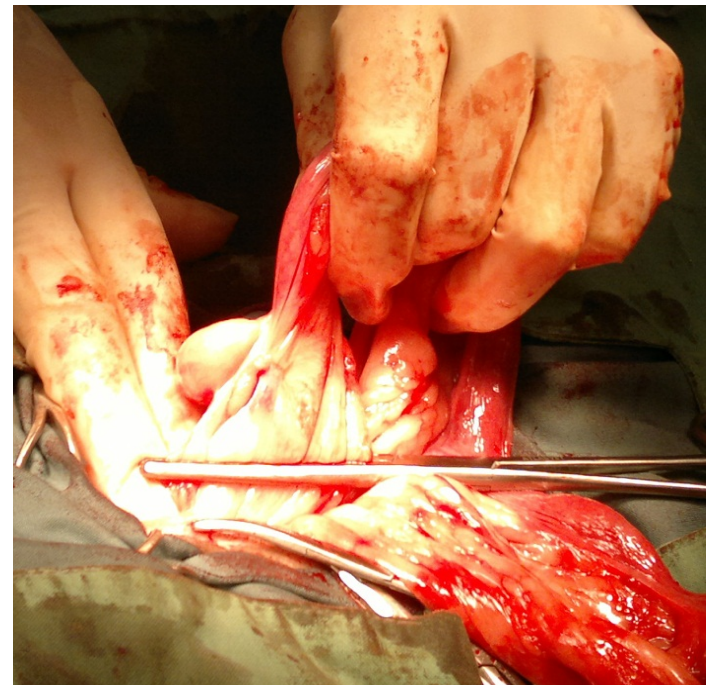
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The left ovary is more dependent than the right – so is more easily exteriorised and usually allows plenty of room for the 3 clamps

When using curved Rochester Carmalts – or any curved clamps for that matter – always place them with the tips pointing up – not down.

This avoids the high risk of the tips grabbing unwanted tissue (usually omentum) when you tighten them.

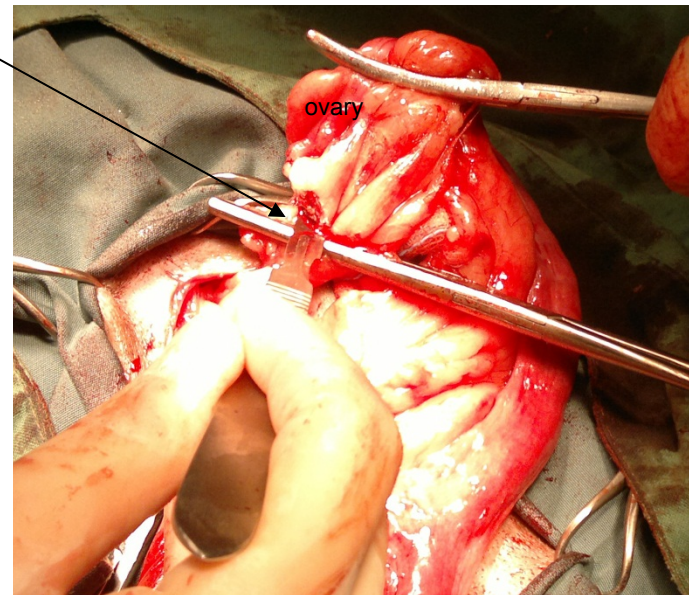
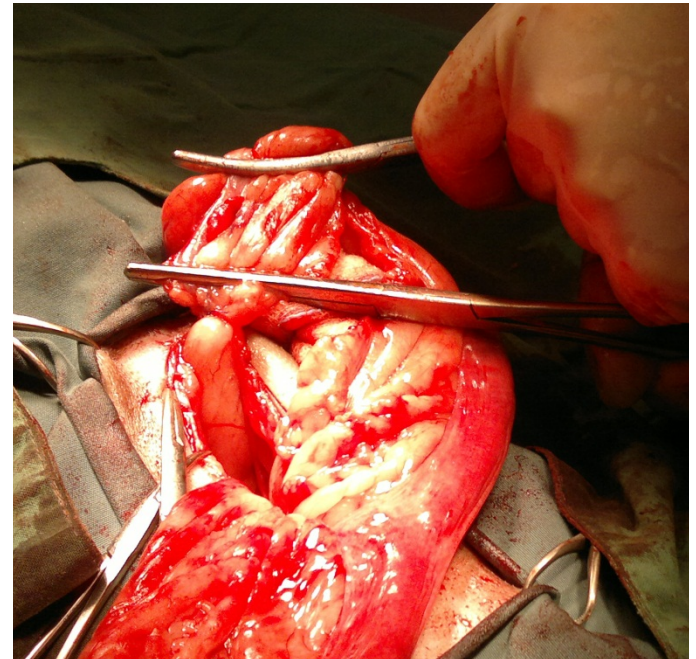
Similarly – with curved instruments in general – and scissors in particular – always have the tips coming back toward your body as you work. They are designed to aid your visibility and are the preferred option of experienced surgeons.



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With the ligature safely secured the left stump can be cut free by sharp incision across the distal side of the (now) most proximal clamp.

Try not to cut absolutely flush on the top of the clamp – you need to retain a small collar of tissue above the jaws of the clamp to prevent the pedicle slipping through the jaws!

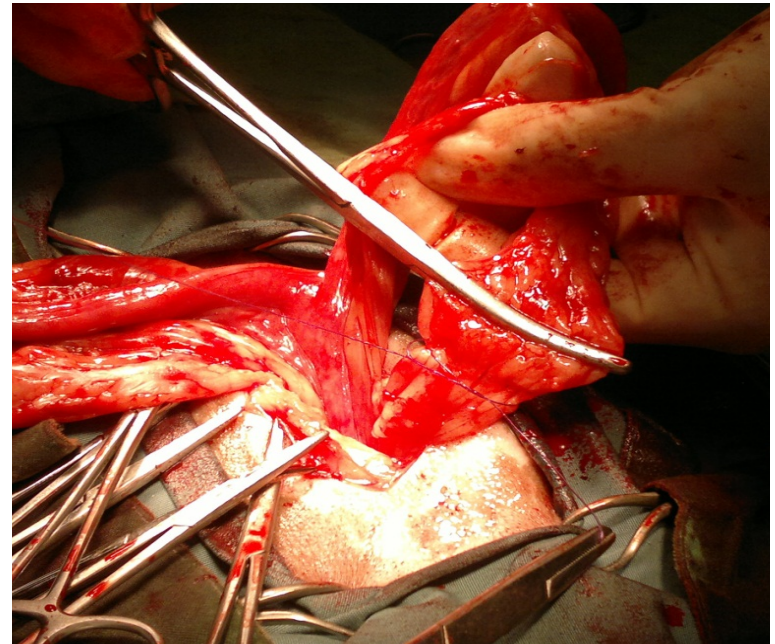
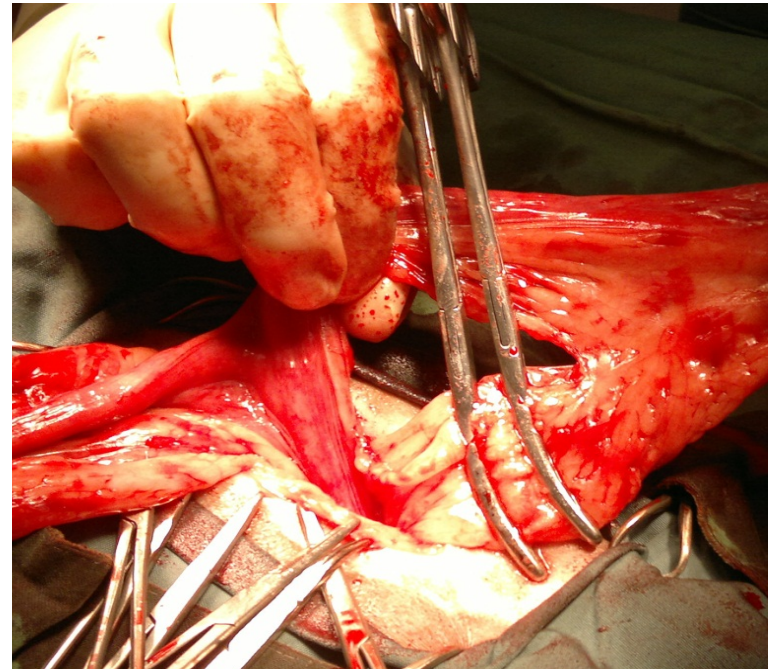


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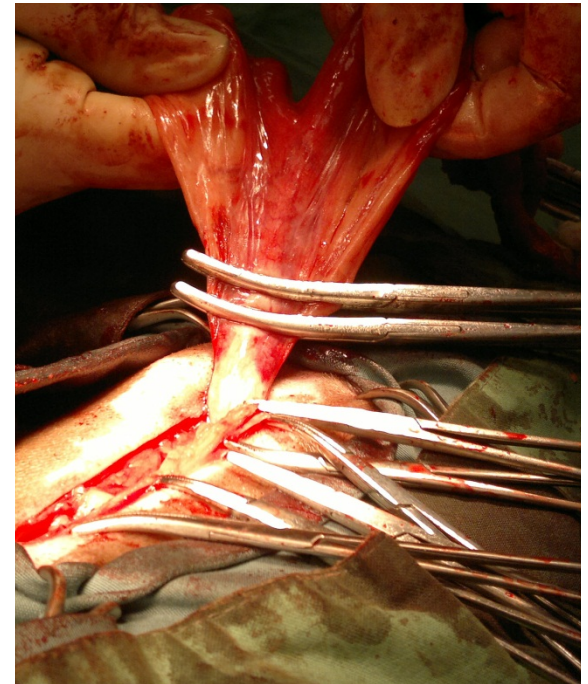
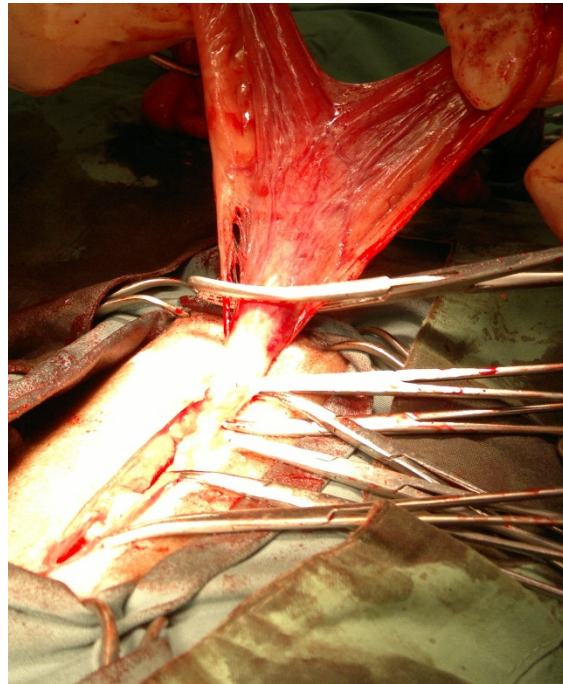
This broad ligament is very fatty and vascular – so in this case the surgeon elects to ligate the ligament to avoid the inevitable slow oozing haemorrhage which would likely follow.

In most cases it is fine to simply separate the ligament bluntly using fingers or clamps to tear the tissue.

In engorged and very large uteri the large uterine blood vessels which lie lateral to the body are ligated separately to the uterine body itself.

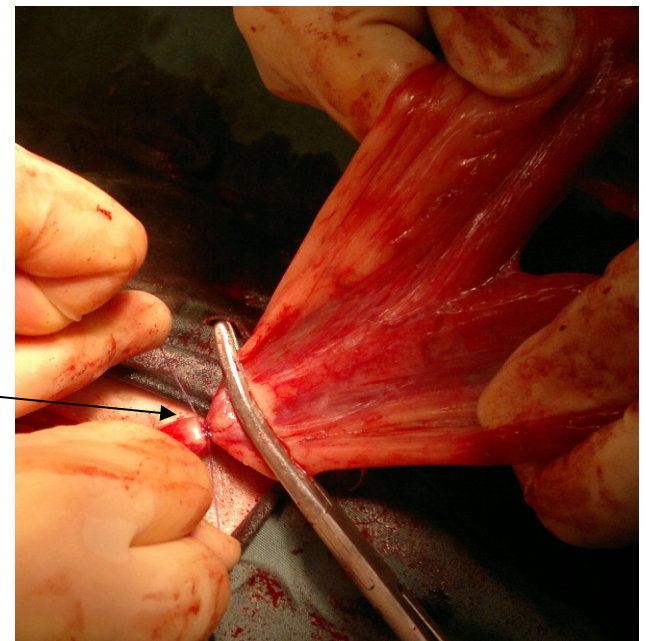


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With the broad ligament removed the clamps can now be applied just cranial to the cervix.

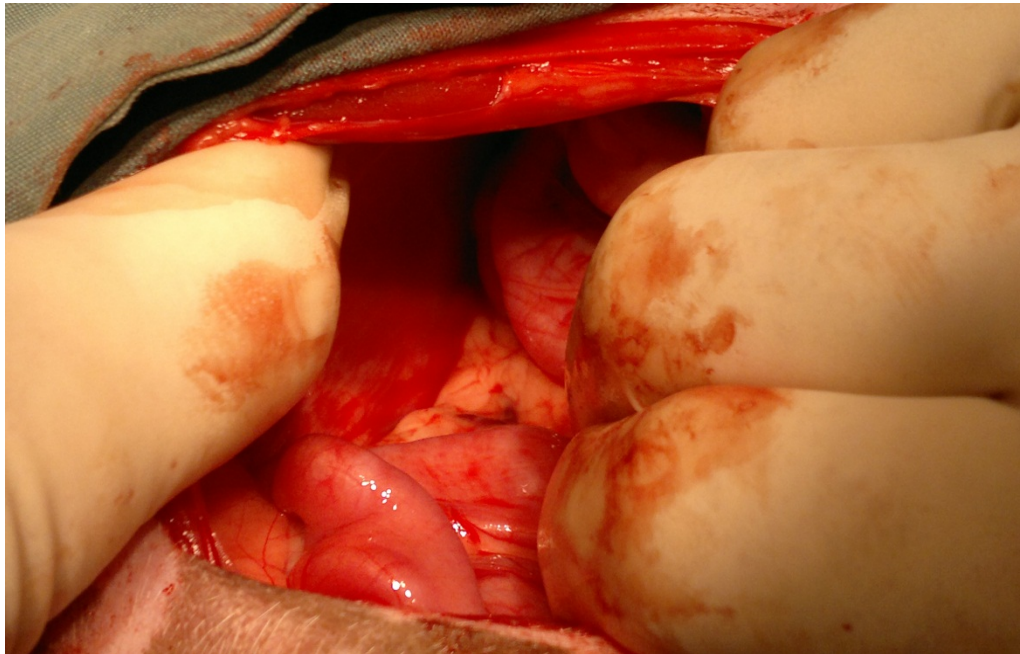
An encircling or Millers ligature is being placed in the crushed tissue of the most proximal clamp. A transfixation ligature can now be placed in the uncrushed tissue just distal to this.



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On completion of the uterine body ligation we are almost ready to close. Before doing so – check for haemorrhage.

In the speys we do the abdominal incision is usually long enough that we can look into the left and right paralumbar gutter and observe for the presence of blood. Use a swab to dry the gutter then check again. If blood starts to return into the gutter – observe carefully if it is coming from cranial or caudal. This tell you which quadrant the bleeder is in that requires your attention.



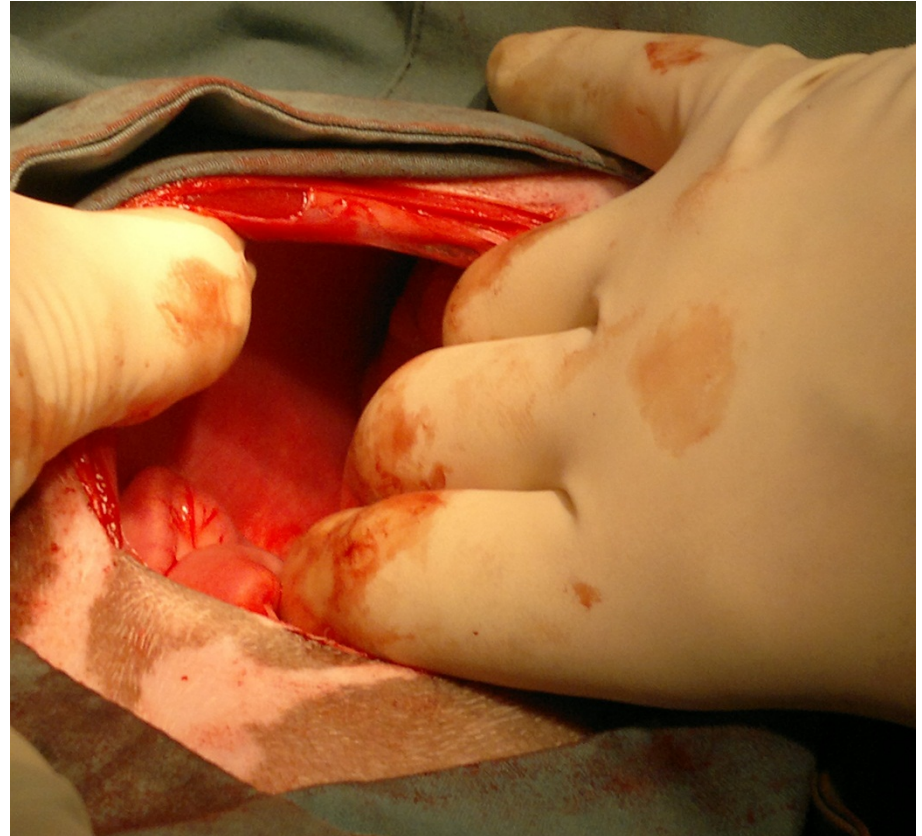
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In general practice you normally have a smaller abdominal incision and it is not easy or possible to check the gutters.

In this case rely on the presence of abdominal haemorrhage at the incision site.

If its there – extend the incision and proceed as above.

There is a curious and misplaced belief in practice that your skill as a surgeon is inversely proportional to the length of your spey incision. Nonsense of course – NEVER hesitate to extend your incision if it improves your peace of mind and the chance of a successful outcome!



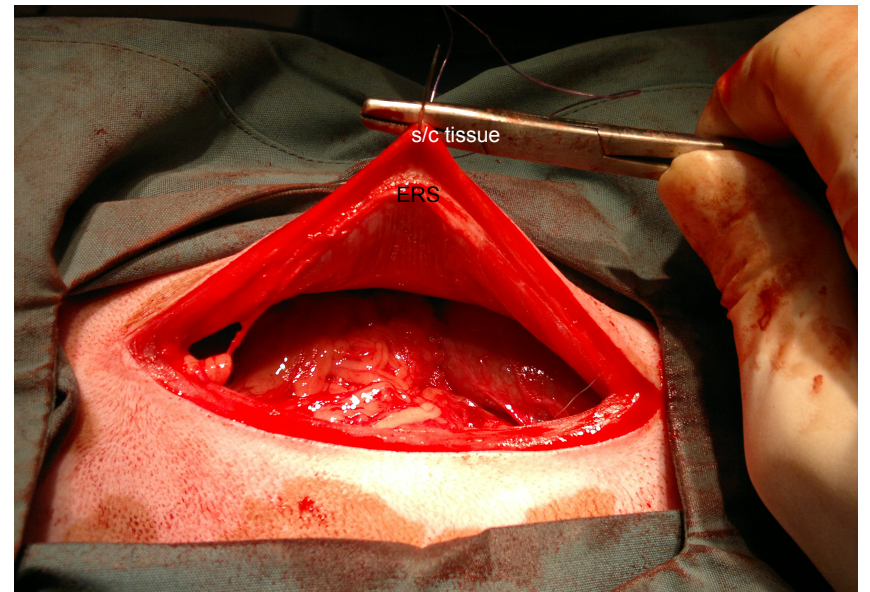
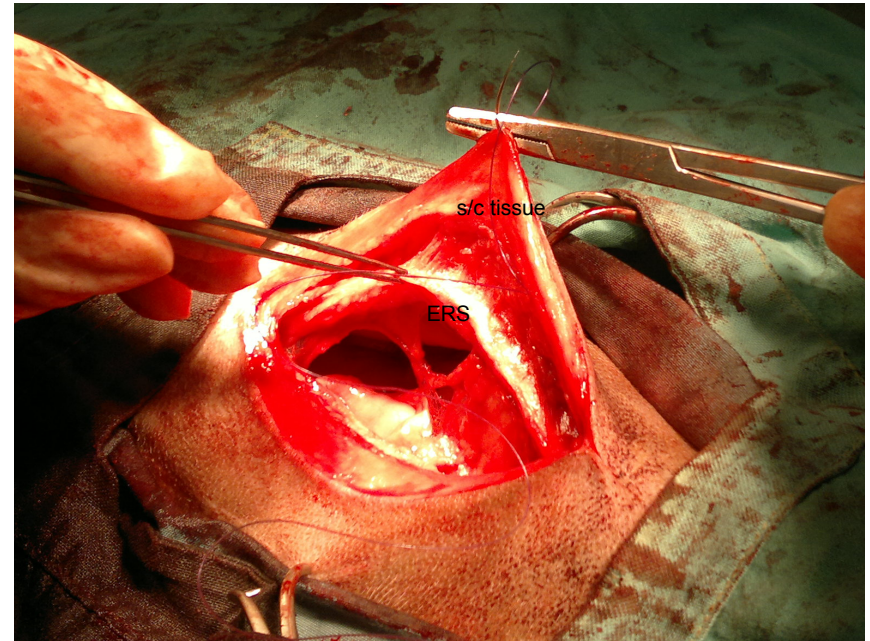
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Closing the linea alba needs to be done carefully to ensure that the external rectus sheath on each side is firmly apposed across the midline.

**Another Halstedian Principle: accurate approximation of tissue layers!*

My preference is to start in the centre of my incision to enable rapid closure of the abdomen. This reduces losses of heat and moisture as well as prevents bowel eventration if the patient has abdominal contractions (due to light anaesthesia!).

Key to a precise closure (or any surgical manipulation for that matter) is good visibility. Note how the surgeon can employ the needle and needle driver as a retractor to elevate tissues away to reveal the linea alba.



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The surgeon is demonstrating how to use the needle and needle driver as an effective and atraumatic retractor. Here the subcutaneous tissue on the near side is being lifted away to allow unimpeded visibility of the external rectus sheath (ERS) which the thumb forceps can then pick up.

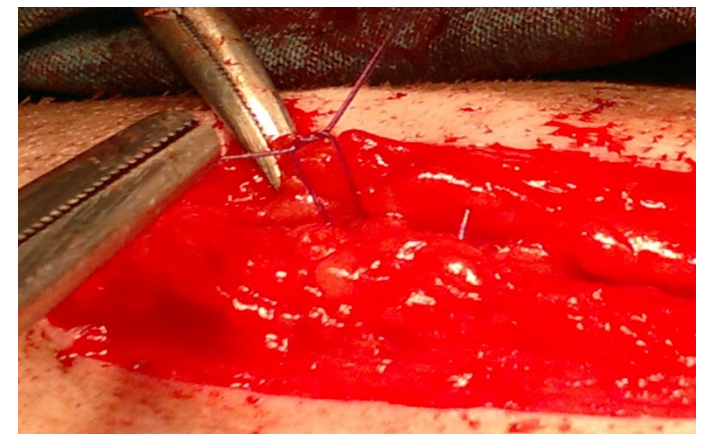
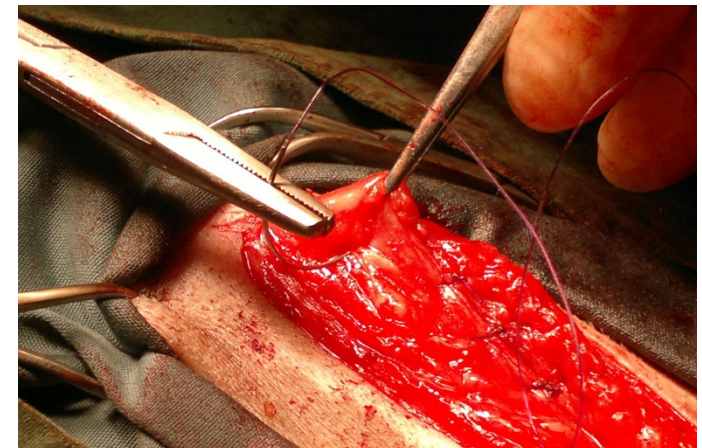
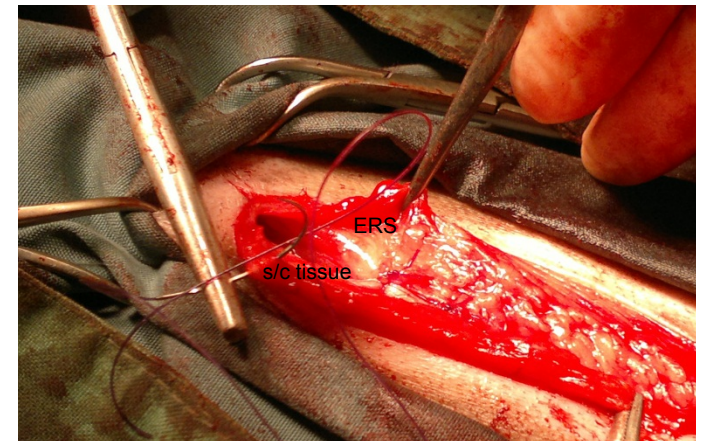
The needle is then released, the rectus sheath is drawn away by the thumb forceps – once again improving visibility for needle placement.

It is very easy to pick up s/c tissue thinking you have the rectus sheath – so good visibility is important.

With the suture loop in place, be sure that all your throws go down onto the tissue “square”.

Square knots imply 2 throws which form a reef knot – not a granny knot! And never do less than 2 square knots (i.e. 4 throws).

If a knot goes down as a slip knot – do it again – square!



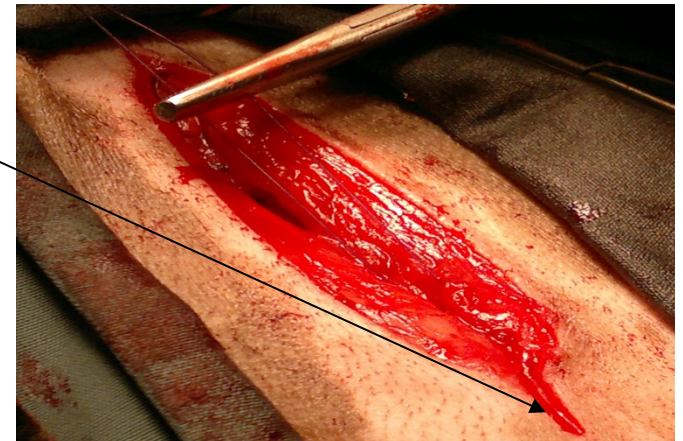
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Start your s/c continuous suture with a buried knot (both strands must come from the depth of the wound to achieve this)

Here the surgeon is pulling both strands away from the sutured incision and in so doing the edges come nicely together.

**Halstedian principle: Ensure the obliteration of dead space. The s/c suture also serves to achieve another principle – Minimising Tension! This time in the skin above by pulling the edges into near apposition.*

Secure your buried suture with 5 throws and start your running suture or horizontal mattress suture from the depth of the wound. This means that once tied and the short end cut short, direct your needle back into the depths in the centre of the wound and come out superficially where you intend to commence the line.



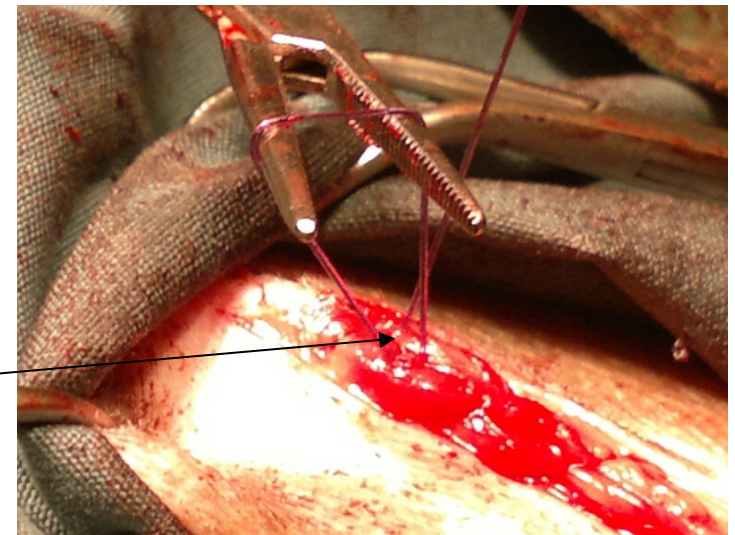
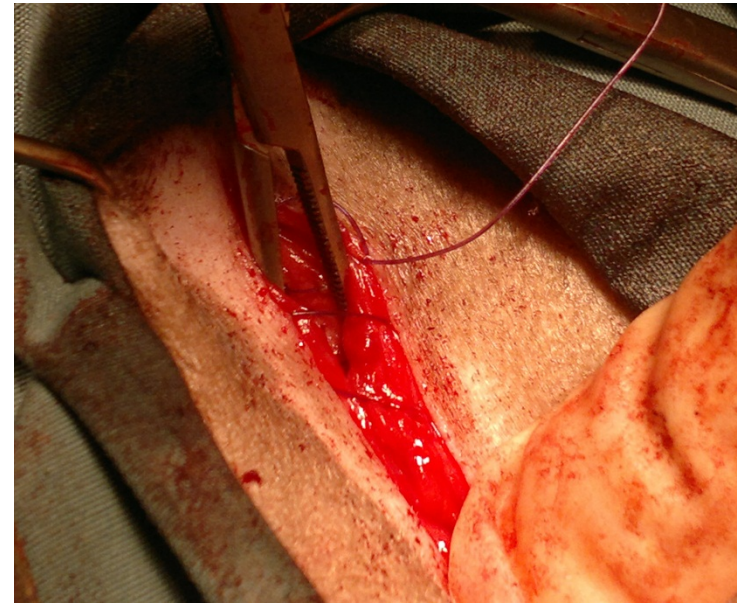
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At the end of the s/c suture line you once more bury the suture. One easy way of doing this is to simply complete your line to the very end of the incision, then reverse direction and come back 1 suture width before emerging with the suture from the depth of the wound up through the centre of the incision.

Then use forceps to spread the incision apart and you will see the previously placed deep suture strand you need to tie with.

Lift the strand up and tie off with an Aberdeen knot or 2 simple square knots.

Note in the picture to right that all the suture strands emerge from the depth of the wound – up between the two sides of the incision.



3-0 monofilament absorbable of short to medium term duration is recommended for s/c. Monocryl or Monosyn would be ideal.

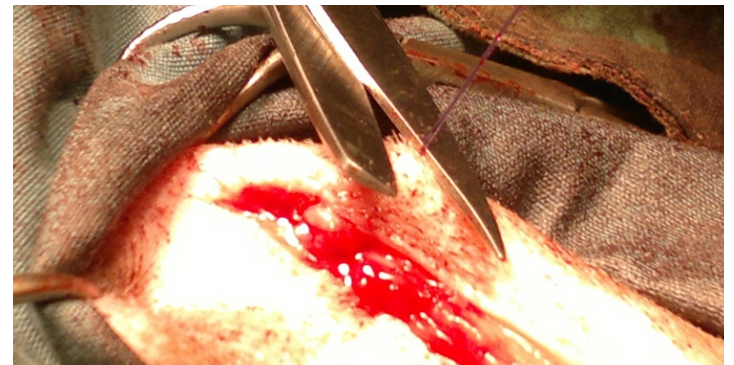
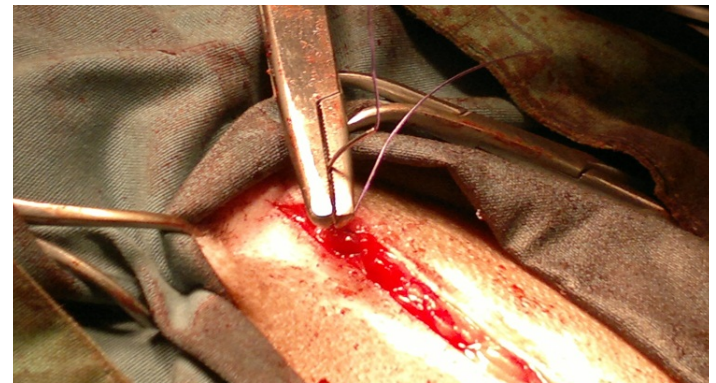
Canine Ovariohysterectomy

Place your knot as deep in the wound as practical

Now pass the needle back into the centre of the wound and out through adjacent skin – this then tugs the knot into the depth of the incision.

It is important not to allow the needle to engage any tissue as you pass it back through the centre. If it does you will effectively be pulling your carefully buried knot back to the surface as it tries to go through the inadvertently engaged tissue!

Pull tight and cut the suture free at the level of the skin.



Canine Ovariohysterectomy

Skin sutures:

Although the Ford Interlocking continuous suture pattern is neat and fast – like all the continuous patterns it relies upon secure and careful application.

In less experienced hands an interrupted pattern – simple interrupted or cruciate sutures – are safer.

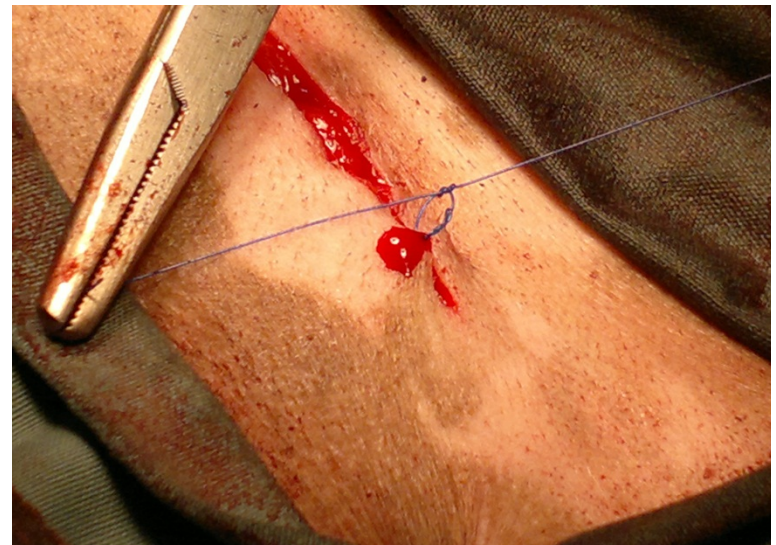
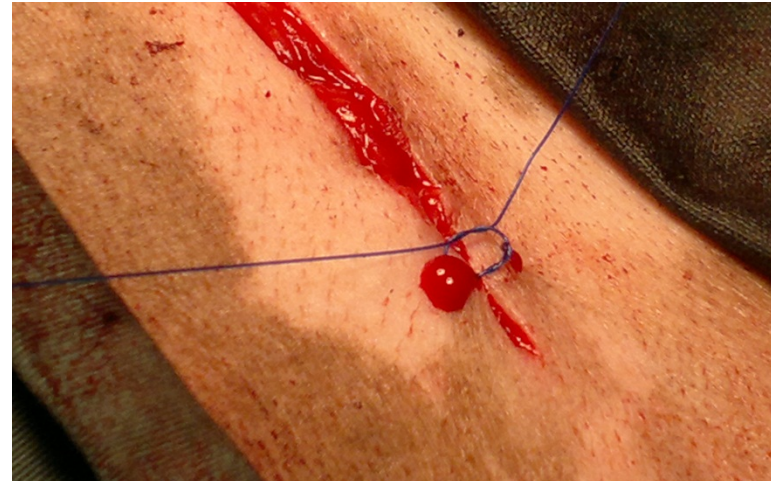
Whatever method is selected all skin sutures are placed loose to accommodate some post-op oedema. Some surgeons will even leave expansion loops so that the suture can expand if needed.

When handling skin use your thumb forceps – Adsons usually – with care.

Skin does not take kindly to trauma!

A gentle technique will minimise post-op swelling and pain at the incision site.

**Halstedian Principle: Ensure atraumatic technique!*

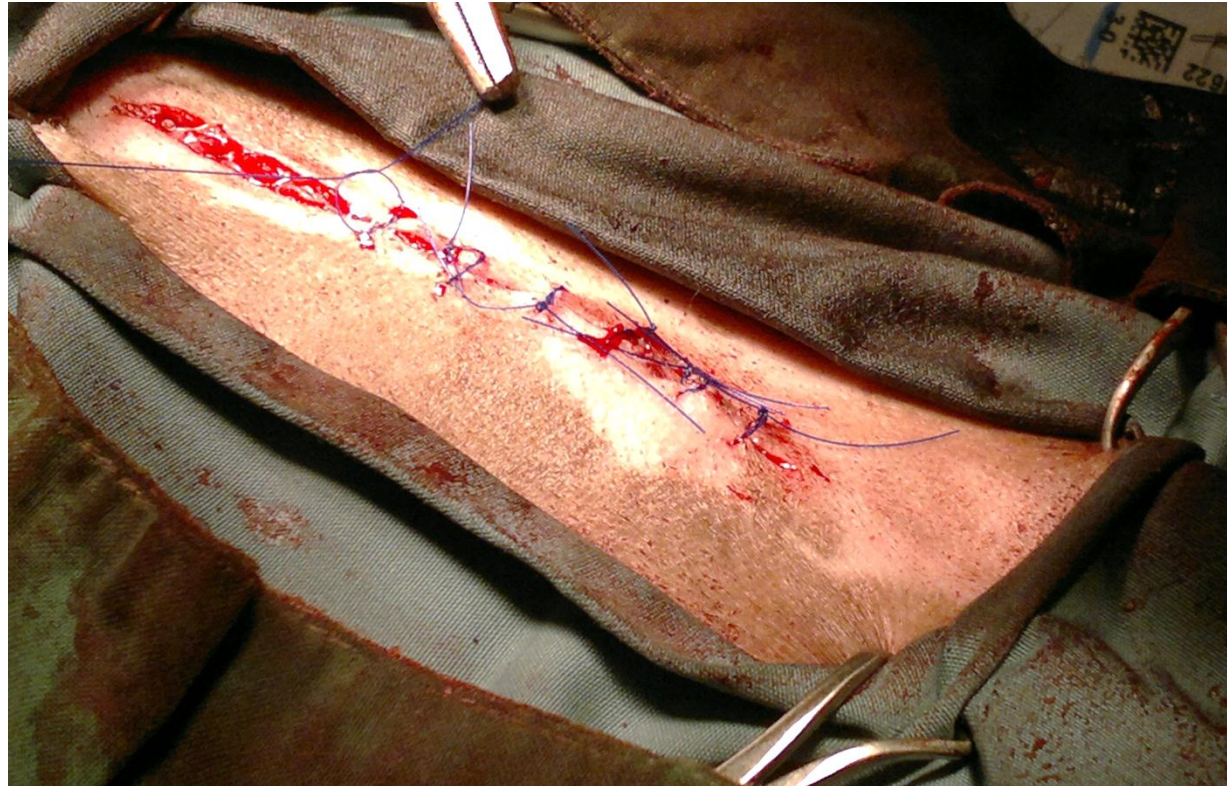


Make sure every throw goes down 'square' – if it forms a slip knot you need to correct it - or do another which is square!

Canine Ovariohysterectomy

Leave long ends on skin sutures or risk making an enemy out of your nurse who has to remove the sutures!

The picture shows a simple interrupted pattern with sutures about 7 or 8 mm apart tied with expansion loops.



The suture often used for skin closures is 3-0 Prolene. This is a suture with a lot of memory! It can also come swaged onto a straight cutting needle which is excellent for cutting through the tough connective tissue of the dermis – but also slices every blood vessel in range as it does so!

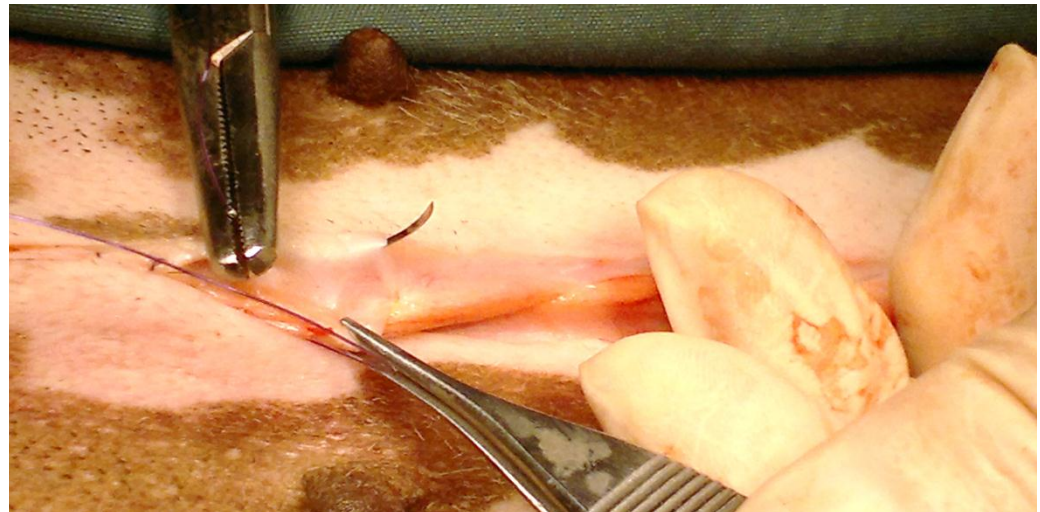
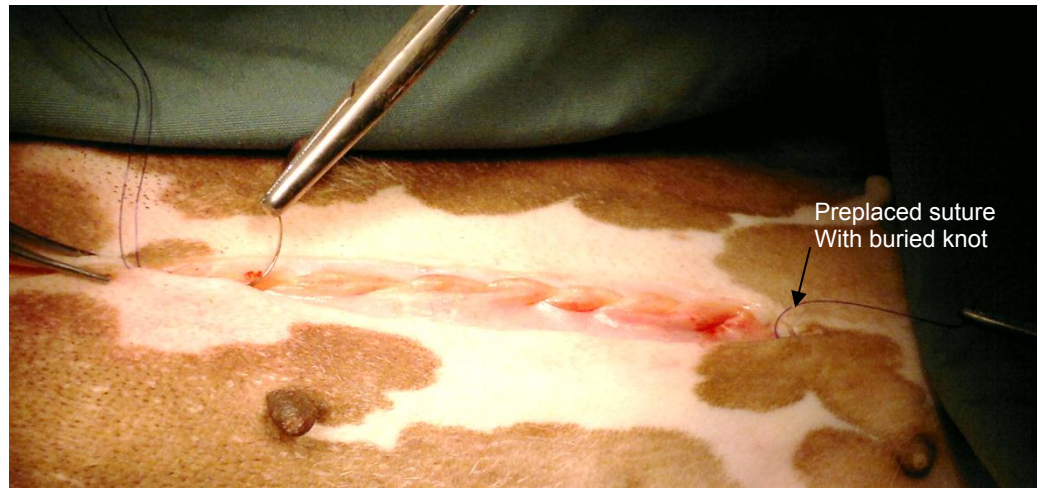
Canine Ovariohysterectomy

An alternative is to close with an intradermal suture pattern.

One easy technique to ensure reliable burying of the knots is to employ a pre-placed buried knot and suture strand at the end of your incision ready to tie to.

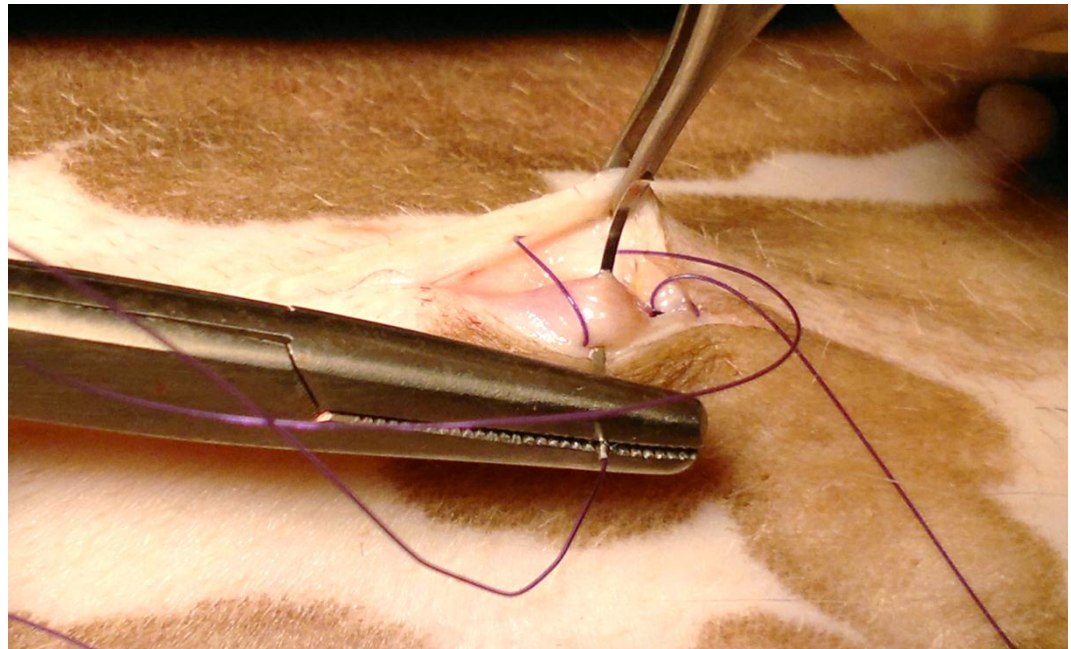
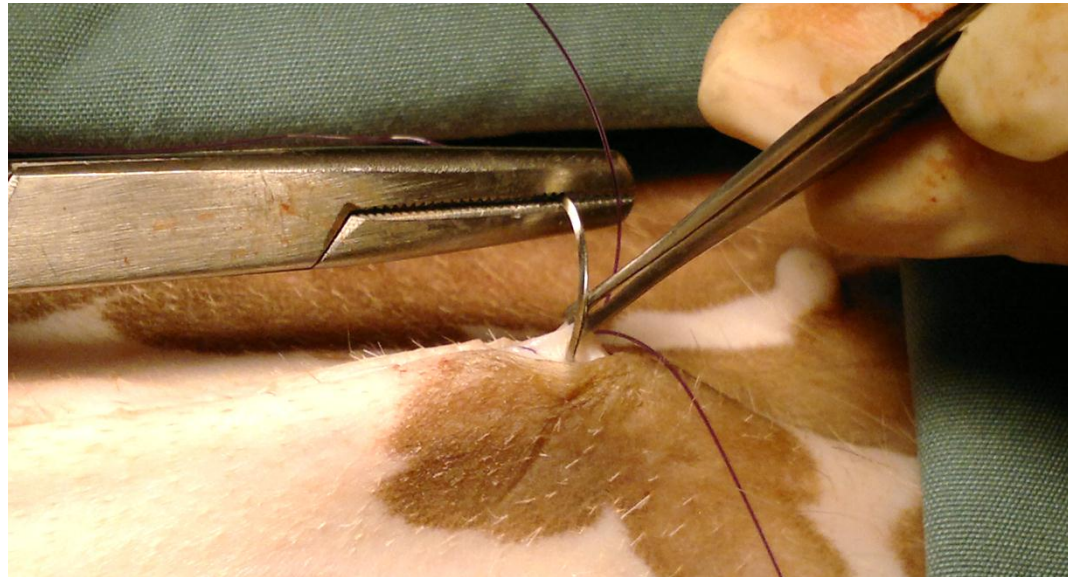
Once that's placed go back to the other end of the incision and repeat the buried knot – but this time use the strand and swaged on cutting needle to progress along the incision with a horizontal mattress pattern.

Note how the surgeon takes large bites of tissue and overlaps the bites on each side.



Canine Ovariohysterectomy

When you reach your pre-placed suture strand, change your last horizontal bite into a vertical one and exit through the centre of the incision.

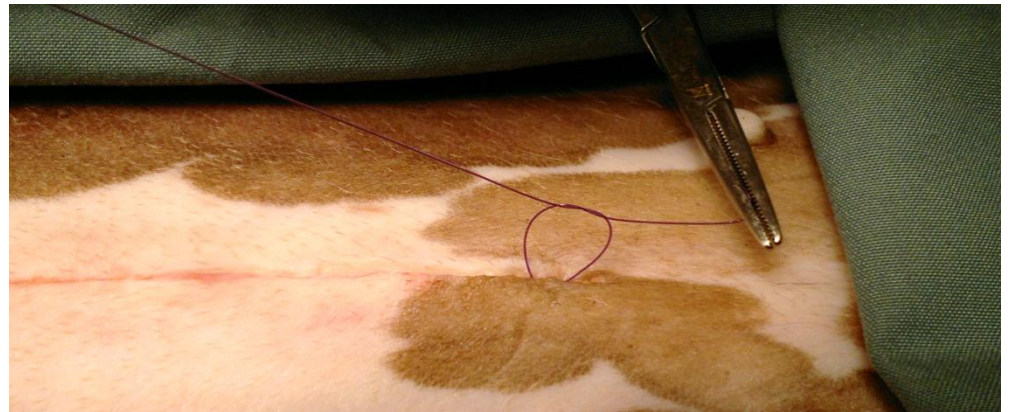


Canine Ovariohysterectomy

Now tie off the two strands burying the knot as you do so. Cut the non-needed strand close to the knot.

Note how the surgeon is tightening the 2 strands by directing tension parallel with the wound rather than across transversely!

This reduces the tendency to spread the wound edges apart – just what we are trying to avoid!



Canine Ovariohysterectomy

Finally, carefully direct the needle back between the wound edges and under the knot you just tied and out through the skin caudally – pull the suture taught and cut level with the skin.

