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Components:
» Patient Preparation Area
» Operating Theatre
» Surgical Supply
» Surgical Store
» Kennels

Policies:
» Thorough Pre-operative Assessment
» Safe Anaesthesia Protocols
» Sound Surgical Technique
» Consistent Post-operative Care
» Detailed and Accurate Record-keeping

* For more details please refer to VBB Clinical Policies 2012 document

Patient Preparation Area
To minimise contamination with hair and excreta, if possible anaesthetic induction, shaving and prepping should be performed in a separate room or at least on a separate surface from the surgery table.

Operating Theatre/Surgical Area
If possible this area should be reserved for theatre staff and anaesthetised surgical patients only and should contain:
» Surgical scrub sink and tap (this might be in the patient prep area)
» Surgical tables
» Sterile surgical kits
» Drugs and/or equipment for anaesthetic maintenance
» Supply of surgical materials (suture, needles etc.)
» Surgical waste bins
» Sharps containers

Surgical Supply
This area is dedicated to the cleaning and sterilising of surgical instruments and drapes, and should include:
» Sinks or bowls for cleaning of used instruments and drapes
» Table with clean/dry surface for preparing new kits and storing sterile kits
» Autoclave

**Surgical Store**
» Secure storage of surgical instrumentation, materials and drugs
» Appropriate storage conditions: e.g. refrigeration; cupboard for light-sensitive drugs
» Lockable dangerous drug cupboard and register
» Maintenance of accurate inventory
» Pre-emptive ordering

**Kennels**
To enable adequate post-operative care, it is essential that the kennels offers:
» Supervision by trained personnel
» Secure accommodation providing shelter from the elements
» Regular removal of stools and daily washing of floors
» Weekly disinfection with viracidal agent if possible
» Adequate lighting
» Water supply
» Provision of appropriate clean and dry bedding
» Isolation pens: for patients with suspect contagious disease, particularly rabies, and also for patients receiving chemotherapy (e.g. vincristine for treatment of TVT)
PRESURGICAL MANAGEMENT

Routine Pre-surgical Physical Examination

Confirm Diagnosis Pre-op, if possible

Assessment Of Fitness For Anaesthesia And Surgery

Detailed Plan:
» Preoperative
» Anaesthesia
» Intra-operative
» Postoperative: in-patient or outpatient

Routine Pre-surgical Physical Examination
General physical assessment with specific regard to the possible coexistence of problems such as:
» Body condition, e.g. cachexia
» Dehydration
» Shock
» Hypothermia or Hyperthermia
» Skin infections
» Neurological conditions
» Pregnancy/Oestras/Cryptorchidism/TVT
**ANAESTHETIC PROTOCOLS**

**Premedication**
Sedation/tranquillisation/analgesia given to:
» Reduce dose requirements of anaesthetic agents as a result of sedation and analgesic action
» Facilitate handling of patient for induction

Commonly-used combinations:
Premed: **xylazine** (20 mg/ml): 1–2 mg/kg IM (recommended max. dose approx. 2ml)

*NB: young pups (6-12 weeks): approx. 0.5 mg/kg xylazine
AVOID if: hypotension, hypovolaemia, heart disease, liver disease*

Phenothiazine tranquilliser (e.g. triflupromazine; acepromazine) + *(opiate analgesic or tramadol)*

NB phenothiazines have NO analgesic properties

Triflupromazine (Siquil) dose = 2.2–4 mg/kg IM
(use low end if combining with tramadol)

**Induction**
» Should be performed on preparation table
» An ideal agent used should be:
  • Safe
  • Able to be given intravenously
  • Rapid in action
  • Non-irritant perivascularly
  • Enable smooth induction and recovery

Commonly-used agents:
Induction: Ketamine (NB 50 mg/ml): 2.5 mg/kg
  Diazepam (5 mg/ml): 0.25 mg/kg
  Mixed equal parts in the same syringe.
  Given at a rate of 1 ml mixture per 10 kg, and top up doses, if required.
  Some practices use 2 parts Ketamine to one part Diazepam in the mixture for top up doses.
  For high volume ABC surgeries, a number of 10 ml syringes of the mixture can be prepared at the start of the day.

OR
  Xylazine (20 mg/ml)
  Ketamine (50 mg/ml)
  Mixed in same syringe 1 part Xylazine to 2 parts Ketamine (e.g. 3 ml Xylazine to 6 ml Ketamine).
  Given at a rate of 2 ml for 10 kg, 3 ml for 20 kg, 4 ml for 40 kg, and top up doses of 0.5 ml, if necessary.
OR

Thiopentone 2.5 % (less risk of severe perivascular reaction than 5% solution). Administer 2.5% solution @ 4 ml/10kg to premedicated patient; avoid administration to cachexic or very lean patients (barbiturates are metabolized by adipose tissue). Must still inject isotonic saline locally if administered perivascularly (twice the estimated volume of perivascular Thiopentone); less analgesic effect than Ketamine (therefore premedication should include Xylazine or Opiates).

**NB:** Immediately following induction, a suitably-sized endotracheal tube should be placed and the cuff inflated to the minimum pressure required to prevent inhalation of gastric contents should vomiting occur; the patient should be placed on and partially-covered with an insulating layer such as an insulating Mirotec pad/towel/bubble-wrap to minimise heat loss.

**Maintenance**

- Ideally should involve use of inhalation anaesthetic agents such as isofluorane or halothane in combination with medical oxygen.
- In the absence of inhalation agents, anaesthesia may be maintained using incremental administration of induction agents.
- Depth of anaesthesia should ideally be closely monitored so top up doses can be given in a timely manner.
- Avoid giving multiple low-dose increments as this will result in a significant increase in the total dose of agent, and prolonged recovery time (especially with barbiturates).
- Ensure very careful placement of IV needle/catheter, and tape to limb securely.
- Intravenous fluids (preferably warmed to body temperature) are routinely administered intra-operatively for most surgeries and are a must if prolonged anaesthesia is likely or the patient is dehydrated or hypovolemic.
Recovery

» Following completion of surgery, patient should be kept warm and closely observed in a quiet area.
» **Analgesia**: Meloxicam: 0.2 mg/kg should be administered on removal of the ET tube.
» Endotracheal tube should not be removed until patient has a strong gag reflex – remember to deflate cuff before removal.
» Examine tube for evidence of blood, vomit etc., and manage, if necessary.
» In the event of excitation/distress on recovery: administer tranquilliser (e.g. Diazepam) or additional analgesia (e.g. Opiate), as required.
» Only return patient to kennels when able to sit up unassisted.
Clothing: the surgeon should wear clean and fluff-free short sleeved scrub top which allows appropriate scrubbing as far proximally as the elbow.

Ideally a surgical hat and mask should be worn; at the very least, long hair must be tied-up and facial hair closely-trimmed.

Finger nails must be cut short.

Should the surgeon have an infected wound or sore on the hands or forearms, it is preferable that surgery be postponed until such time as this has healed.

Surgical Scrub
An acceptable germicidal preparation, e.g. Chlorhexidine or Betadine, must be used.

Scrubbing:
» The hands and arms are washed first with the scrub mixture to remove any gross contamination.
» The nails are cleaned next, before the scrubbing procedure begins.
» A sterile brush is used to scrub:
   1. the fingers
   2. the hands
   3. finally, the arms
» In that order, scrubbing over a period of no less than 3 minutes, and ideally 5 minutes (particularly the first scrub of the day). Once the brush has been used on the arms, it should not return to the fingers.
» The contact time of the scrub solution on the hands and arms is the most important factor in ensuring effective disinfection.
» Alternatively, brushless scrubbing can be used (in fact, this may be preferred since brush scrubbing has been associated with increased shedding of skin cells and bacteria). A brush should still be used for the fingernails. Care must be taken to concentrate on all parts of the hands and forearms, and to ensure that the contact time is optimal (3–5 min).
Rinsing:
When scrubbing is completed, the hands, arms and the brush should be rinsed in water, allowing the water to drip from the elbows to prevent contamination of the hands with drips from upper arms. Do not shake the hands after rinsing.

Drying:
Using a sterile towel, dry the hands on one side of the towel, then fold the towel in half and dry one arm on one quarter—moving from the wrist to the elbow. Dry the other arm on the other quarter of the towel in the same manner.

Alcohol Spray:
With the hands held above the level of the elbows, surgical spirit should then be sprayed on the hands and then the forearms, and allowed to dry.

Surgical Gloving:
Once the arms and hands are dry, sterile surgical gloves are donned in the appropriate manner, ensuring that the fingers do not contact the outside of the gloves. If this occurs, both gloves should be discarded and a new pair applied.

**ONCE GLOVED, THE SURGEON’S HANDS MUST NOT BE HELD BELOW THE LEVEL OF THE OPERATING TABLE UNTIL THE END OF THE PROCEDURE (THE AREA BELOW THE TABLE TOP CANNOT BE CONSIDERED STERILE).**
Opening Of Instrument Pack
A non-scrubbed assistant will then present the kit to the surgeon in one of two ways, depending on whether the kit was double- (preferable) or single-wrapped:
» Double-wrapped: the outer wrap will be held and opened by the assistant; the surgeon will then remove the pack, handling only the inner wrap, place it on the table and unwrap the kit. **Care must be taken, at all times, not to touch the table or the patient as these are not sterile areas.**
» Single-wrapped: the assistant will place the kit on the table and will unwrap the first fold only. The surgeon may then completely unfold the wrap, **taking care to handle only the sterile aspect of the wrap.**

Sterile Draping
» To isolate the surgical site in a sterile field, one of two draping options may be considered:
  • Single fenestrated drape: frequently used in routine procedures such as desexing
  • Quadrant draping: using four non-fenestrated drapes: for procedures requiring longer incisions
» In both techniques, the drapes are stabilised to the patient using at least four sterile towel-clips. The clips should not be applied in such a way as they grasp the entire thickness of the dermis, as this will lead to painful puncture-wounds which may cause the patient to lick the area and traumatisethe surgical site.
» It is best to ensure that, when unfolded, the field drape overlaps the kit drape: this will reduce the risk of a breakdown in sterile technique.
Lay-out Of Instruments
» The surgical instruments should then be arranged in a logical and consistent fashion as befits the procedure.

On Completion Of Surgery
» Following removal of the patient, the surgery table should be thoroughly cleaned with an appropriate disinfectant solution, such as Lysol. Do not forget to clean the sides of the table.
Cleaning Of Used Kits And Drapes
» As soon as possible after the completion of a procedure, both the surgical instruments and drapes should be thoroughly washed and rinsed, ensuring removal of all blood and discharges. A toothbrush is useful to clean instruments thoroughly, with particular attention to the jaws, box joints and ratchets.
» Drapes should then be hung to dry; once dry, they should be brushed to remove all hair.
» Cleaned instruments should be placed on a towel to dry; instruments with ratchets should be left open.
» Periodically, instruments should be left to soak overnight in protective instrument milk.

Preparation Of Surgical Packs
» Dry instruments should be laid on a dry wrap. A useful technique is to feed one of the handles of all instruments with finger-loops, other than the towel-clips, through the shaft of the longest instrument (frequently the needle-driver).
» An appropriate number of swabs should be included in the kit. The swabs should be folded over the ends of the instruments to avoid puncture of the wrap.
» The wrap is the folded once, longitudinally.
» A hand towel is then laid.
» The final folding is performed and the wrap secured with a small piece of autoclave tape.
» Ideally this inner-wrap is then covered with a second wrap, and autoclave tape applied as before.
» In high volume projects swabs, hand towels and suturing needles may be packed separately from kits, in bulk packs of their own. Care must be taken when opening and closing these packs to allow the surgeon to take swabs/towels/needles out in a sterile manner.
» The pack is identified and dated (by writing on the tape) and placed in autoclave (best) or pressure cooker.

Autoclave
» Carefully follow instructions for operation and care of the autoclave.
» Unit must be regularly checked for faults/safety.
» Use indicators in packs to check adequacy of sterilisation.
» Packs should be double-wrapped if at all possible.
» All packs for sterilisation must be dated and re-sterilised after 4–6 weeks if unused.
» Items should be laid on their side in the chamber of the autoclave and must not be tightly packed, as this will reduce efficiency of sterilisation; steam must be able to circulate.
» If packs are moist when removed from the autoclave, recalibration of the drying-cycle of the unit may be required.
» Until the recalibration has been carried out by a trained technician, moist packs should only be placed to dry on clean, dry, plastic sheeting which has previously been sprayed with surgical spirit; otherwise contamination of packs will occur.

**Time/temperature relationships for steam under pressure:**
The following are times at which materials being sterilised must be at the target temperature. They do not take into account time for penetration by steam or ‘heat-up lag’.
• 3 minutes at 134 °C (273.2 °F) 29.4 psi
• 15 minutes at 121 °C (249.8 °F) 15 psi
Intra-operative Intravenous Fluid Administration

Indications:
» Debilitated patient
» Dehydrated patient
» Shock/Hypovolaemia
» Hypotension
» Haemorrhage
» Very young patient: poor homeostatic response
» Prolonged procedure
» Procedures associated with high risk of intra-operative complication
» Procedures likely to require intra-operative administration of intravenous medications

NB: Ideally fluids should be administered at body temperature

Choice Of Fluid:
» Healthy patient: Crystalloid Solution (NaCL or RL)
» Paediatric patients: 5% Dextrose Solution (prone to hypoglycaemia)
» Sick patient, choice of fluids is dependent on symptoms/diagnosis/biochemistry results

Rate Of Administration:
» Routine procedure: during surgery: 10 ml/kg/hour
» 10–20 ml/kg/hour in paediatric procedures
» Or as clinically indicated for other conditions
Perioperative Antibiotics

Classification Of Surgical Procedure:
Sterile: e.g. routine ovariohysterectomy
Clean: e.g. fracture with implants
Clean/Contaminated: e.g. cystotomy/gastrostomy/pyometra
Contaminated: e.g. compound fracture
Dirty: e.g. debridement and suturing of grossly contaminated wound or resection of perforated bowel

Prophylactic Antibiotics: may be used in sterile, clean and clean/contaminated procedures:

» If prophylactic antibiotics are to be given, they should be administered intravenously, no less than 15 minutes before the initial skin incision is made.

» Adequate antibiotic concentration in tissues at the surgical site cannot be obtained if the drug is administered following incision, as the local blood supply is then impaired.

» Local irrigation of the site with antibiotic solutions is of no benefit and may cause tissue irritation.

Commonly-used antibiotics: Cephalexin, Amoxicillin, Cloxacillin, Amoxicillin Clavulanate

Perioperative antibiotics commonly used in VBB projects include:
Amoxicillin + Cloxacillin (Intamox):  20–25 mg/kg IV pre-op
Amoxicillin + Sulbactam (Amoxirum): 10 mg/kg IV pre-op
Ceftriaxone + Sulbactam (Cefzone-S): 15 mg/kg IV pre-op
Amoxicillin LA (Betamox LA): 15 mg/kg SC pre/post-op

Repeat doses should be given as necessary during lengthy surgery (e.g. Cephalexin: given hourly at 25 mg/kg).

If there is no obvious failure of sterile technique in a sterile, clean or clean/contaminated procedure, there is no merit in continuation of antibiotics after completion of surgery.

Therapeutic Antibiotics: used in contaminated and dirty procedures:
to treat existing or inevitable infection

» Selection of antibiotic depends on likely pathogen (e.g. aerobe/anaerobe, G+ve/G-ve).

» These should be administered at recommended dose prior to, during and for several days after surgery: Initially parenterally and then orally for several days, as dictated by clinical response.

» Antibiotic(s) may be changed if no response or if culture/sensitivity performed on samples obtained during procedure indicates alternate antibiotic(s) would be preferable.
Appropriate anaesthetic protocols and surgical asepsis are the keys to success:

**Anaesthesia:** see previous notes

Options include:

» **Premedication:** Xylazine  
  **Induction:** Diazepam/Ketamine  
  This is the protocol most often used by VBB surgeons

» **Premedication:** Xylazine  
  **Induction:** Thiopentone

» **Premedication:** Triflupromazine/Tramadol  
  **Induction:** Xylazine/Ketamine or Thiopentone or Diazepam/Ketamine

Followed by either:

1. **Intravenous Maintenance:**  
   Usually incremental administration of Diazepam/Ketamine or Thiopentone or Xylazine/Ketamine

   *NOTE: Administration of repeated doses of Thiopentone leads to very prolonged recovery time, especially in the thin patient.*

   or

2. **Gaseous maintenance:**  
   Delivery of Isoflurane in oxygen via anesthesia unit is much superior to maintenance by repeated intravenous administration of an induction agent. Some VBB projects are fortunate to be able to possess this specialised equipment for use during training sessions. However, costs of operation preclude its use in routine ABC work.

**Surgical Asepsis And Technique:**

» Appropriate sterilisation of instruments and drapes  
» Careful clipping/shaving, cleaning and disinfection of surgical field  
» Diligent scrubbing of hands and forearms with approved antiseptic (Chlorhexidine or Povidone Iodine) prior to surgery  
» Wearing of sterile surgical gloves  
» Aseptic and atraumatic surgical technique
Pre-surgical Physical Examination
Patient Preparation:
» Anaesthetic induction, shaving and prepping must be performed on a separate table to the surgery table, to minimise contamination.
» If intravenous fluids are to be administered, the catheter site should be shaved and prepped as described for the surgical site below. The catheter is then inserted and the primed intravenous line connected.
» The bladder should be palpated and expressed if necessary and genitalia examined for presence of Transmissible Venereal Tumour (TVT).
» The surgical site should be widely and carefully shaved, avoiding trauma to the area: even small cuts can lead to wound infection.
» The site should be thoroughly cleaned with an appropriate germicidal solution (VBB projects use Chlorhexidine, Iodine, Savlon or Multinol depending on local availability.) Multiple pieces of cotton-wool should be used in turn, commencing at the centre of the area and moving towards the periphery of the shaved area, and NEVER back into the centre, otherwise the wound will be re-contaminated.
» Avoid wetting non-shaved areas of the patient.
» Once the shaved area appears free of gross dirt and hair, and the pieces of cotton wool used come off the skin with no staining, then the site can be considered clean, but NOT disinfected at this point.
» Disinfection of the site is achieved using three spray-applications of surgical spirit – one minute between applications. A final spray of iodine solution may also be applied, but ONLY once the spirit has evaporated and the skin is dry. Do not touch the skin during this process, otherwise adequate disinfection will not be achieved. Once again, avoid wetting the non-clipped area as this may lead to “run-off” and contamination of the site.
» The patient is then transferred to the surgery table; in so-doing, take care not to contaminate the prepped area with your hands or non-disinfected parts of the patient.
» The prep table should then be carefully cleaned with an appropriate disinfectant, such as Lysol solution, before the next patient arrives.

Operating Table:
» A clean insulating blanket (e.g. “Mirotec”) should be placed underneath the patient to minimise the risk of iatrogenic hypothermia. Bubble-wrap or aluminium cooking foil may also be used, or at least a towel or blanket, both underneath and on top of patient, but avoiding the prepped area.
» If the surface of the table is exposed where the surgical kit is to be placed, a sheet of plastic should be laid to stop “strike-through” contamination of the surgical instruments (especially with urine or faeces).
Patient Preparation

Operating Table
Surgical Removal Of Both Ovaries and Uterus

Flank Approach versus Midline Approach
In pet dogs, the choice of approach is influenced greatly by the experience of the surgeon, and the condition and reproductive status of the patient. However, in street-dog projects, the flank approach is recommended.

Flank Spay—Advantages:
- Reduced healing time due to increased vascularity of sutured tissue (muscle).
- Less suturing required due to ‘self-closing’ nature of wound (muscle splitting rather than cutting).
- Less wound tension from weight of abdominal contents.
- Less likelihood of catastrophic wound breakdown.
- In lactating bitches, less likelihood of trauma to wound by suckling activity of pups.
- Easier to check the wounds post-operatively.
- Animals can usually be released earlier than following midline approach.

Flank Spay—Disadvantages:
- More traumatic approach in pregnancy or obese patient, as a larger incision is required.
- It may be difficult to expose the opposite ovary and uterine bifurcation, especially if the incision is poorly located.
- If myotomy approach (undesirable) is performed, rather than muscle separation (preferable), there is an increased likelihood of post-operative pain and infection, and increased risk of haemorrhage obscuring surgical view.
- Recovery of a dropped or bleeding ovarian pedicle is difficult: if this occurs, the skin wound should be quickly closed and the dog repositioned in dorsal recumbency. Following skin preparation, a midline laparotomy should be performed to enable location and ligation of the bleeding pedicle. Following completion of the midline surgery, all layers of the flank wound should be sutured as normal.
Midline Approach—Advantages:
» White Line incision—simpler approach with less tissue damage and haemorrhage, and possibly less post-operative pain than flank approach.
» Better exposure.
» In the event of haemorrhage or dropped pedicles, the incision can easily be extended to locate, clamp and ligate bleeding vessels.
» In operations requiring a longer incision, such as advanced pregnancy or pyometra, a midline approach may be less traumatic than via flank.

Midline Approach—Disadvantages:
» Surgical wound is harder to check post-operatively, especially in fractious animals.
» Risk of catastrophic wound breakdown and herniation following release of patient, especially if cat gut is used as the only suture material (NOT recommended).
» Dogs must be kept hospitalised for longer periods, as the healing rate of the White Line is slower than muscle.
The Procedure

Important considerations:
» Palpation of abdomen to assess bladder and status of uterus (pregnancy/pyometra): express bladder if necessary
» Examine vulva and vagina for evidence of Transmissible Venereal Tumour
» Careful preparation of skin
» Appropriate site of incision
» Appropriate size of incision; should be as small as possible (reduced healing time)
» Haemostasis

Flank Approach
Tie upper hind-limb back
Location of incision: dependent on age and reproductive status

NB: Very important to make the incision more caudally in immature bitches to allow ligation of the uterus distal to the bifurcation. If the bifurcation cannot be exteriorized, the horns may need to be ligated separately.

» Oblique skin incision (approx. 3cm long in routine spay)
» Blunt separation of subcutaneous fat: avoiding large local blood vessels
» Identification of external abdominal oblique muscle (EAO)
» Small stab incision in EAO
» Blunt separation of muscle fibres parallel to the direction in which they run
» Identification and separation of Internal Abdominal Oblique (IAO) as with EAO
» Identification of the Transverse Abdominal (TA) muscle, elevation to prevent damage to underlying abdominal organs when making small stab incision, then blunt separation of fibres as with other layers
» Tag TA with Allis forceps at ventral margin of wound
» Insert spay hook into peritoneal cavity at an angle of around 20–30 degrees from horizontal with hook pointing up; raise hook end towards abdominal wall, retract and identify uterine horn or broad ligament fat
» Perform ovariohysterectomy (see below)
» Use appropriate absorbable suture material for ligation of ovarian pedicles and uterus (cat gut is acceptable if no other options)

Midline Approach
» Skin incision from umbilicus caudally: length of incision: between 3 and 6 cm; longer in obesity, pregnancy or pyometra
» Careful sharp dissection to define White Line
» Tent White Line and make small incision into peritoneal cavity
» Extend incision with scissors or blade, taking care not to risk damage to organs in abdominal cavity.

(May inset blunt-tipped instrument (e.g. haemostat) along the inside of the abdominal wall and cut down through the Linea Alba onto this instrument.)
Ovariohysterectomy Technique

1. Elevate ovary from abdomen

2. Gently stretch or “pop” ovarian ligament

3. Double-clamp vascular pedicle

4. Ligate vessels

5. Double-ligate ovarian pedicle before incising (single ligature OK if very immature)

6. Tear, crush or ligate broad ligament
7. Clamp uterine body near cervix if uterus is friable, may not be able to clamp have to apply ligatures without clamping

8. Double-ligate uterine body before incising

**Flank Closure:**
- Insert 1 or 2 horizontal mattress sutures or 2 to 4 simple-interrupted sutures of synthetic material to close TA wound
- Remove Allis forceps from TA and apply to IAO: suture as with TA
- Remove Allis forceps from IAO and apply to EAO: suture as before
- Suture s/c fat with continuous pattern
- Skin closure with buried intradermal pattern
- Can be interrupted or continuous
- Ensure knots are well buried
- Super glue can be used to appose small openings but should NEVER be used to cover up inadequate suturing—it will break down! If sutures have not apposed wound edges, they should be removed and redone
- In lean patients, may combine s/c and intradermal closure as one layer, using simple-interrupted pattern, ensuring knots are buried

**Choice of Suture Material:**
- Chromic Catgut is appropriate for ligation of ovarian and uterine pedicles
- Choose appropriate strength for size of dog (5–10 kg: 2/0 or 1/0; 10–25 kg: 1/0 or 1)
- Synthetic absorbable (e.g. PGA, PDS) is preferable for muscle, s/c and subcuticular sutures, as catgut induces a marked inflammatory response and may predispose to establishment of local infection (5 kg: 3/0 PGA; up to 25 kg: 2/0 PGA)
Midline Closure:
1. Suture linea alba with simple-Interrupted or continuous sutures: ideally ensuring that the internal rectus sheath is included—this is the main strength layer, rather than the rectus muscle itself
2. Suture subcutaneous tissues using continuous pattern
3. Appose skin edges with intradermal sutures +/- superglue

Perioperative Medications:
» Antibiotics: preferably i/v at induction (at least 10 min before start of surgery) +/- long acting dose
» Meloxicam (NSAID)- analgesia (NB renal function)
» Ivermectin- internal parasites and scabies
» Rabies Vaccination
In general, there are two techniques described for removal of the testes, and the technique used is determined by surgeon preference.

Both involve a prescrotal skin incision. A testis is then manipulated into the incision site and the incision extended down through overlying fat and fascia until the outer (parietal) tunic of the testis is visualised.

Thereafter, the two techniques differ.

**Open Technique:**
- Incision is extended through the parietal tunic.
- Testis, vessels and vas deferens are exposed.
- The tunic and scrotal ligament are torn from the caudal aspect of the teste (can clamp the ligament to help removal from teste).
- The cord (vessels and vas deferens) is ligated (with cat gut or synthetic absorbable material) using the 3 clamp technique (or modified 2 clamp, depending on surgeon preference).
  - i.e. 2 clamps applied to the cord, a ligature is placed around the crush created by the first, more proximal clamp. A third clamp is placed distal to the second clamp. The second clamp is then removed and a ligature placed in its crush. This clamp is then placed distal to the third clamp, and the cord is severed between these two clamps.
  - The first, more proximal ligature should be circumferential.
  - A second ligature should be applied, and can be transfixing.
  - The stump is checked carefully for bleeding, and then gently allowed to retract into the vaginal tunic, which can then be sutured to ensure no risk of herniation.
- Second teste is removed using the same technique through the same skin incision.

**Closed Technique:**
- The parietal tunic enclosing the testis is NOT incised but is fully exposed by gentle sharp dissection with a scalpel blade, in a craniocaudal direction, whilst exerting upward pressure on the testis with the fingers of the other hand.
- The testis is then prolapsed into the incision and carefully exteriorized.
- The vascular, spermatic cord and cremaster muscle components are visualized within the tunic.
- The fat and fascial tissues adherent to the caudal aspect
of the parietal tunic are manually torn from off the tunic—this may require significant effort, but should be performed with care—rubbing with a dry swab is of great assistance in disrupting this tissue and in achieving full exposure of the cord.

- The entire cord is clamped, ligated and severed, using the 3 clamp method above.
- The proximal stump is assessed for security of the ligatures and is gently returned into the depths of the prescrotal incision.
- The remaining testis is resected in similar fashion.

**Closure:**
The deep fascia is sutured with synthetic absorbable suture material (not cat gut) using simple interrupted or continuous pattern, incorporating the tissue on both sides and medially. The skin is closed using an interrupted or continuous intradermal pattern, taking care to ensure that the knots are buried.

**Potential Complications:**
In the hands of an inexperienced surgeon, there is more risk of haemorrhage and postoperative scrotal hemATOMA formation with the closed technique, due to ineffective ligation of the thick cord.

The risk of haemorrhage from spermatic vessels is much less likely if this double ligation technique is employed. However, if haemorrhage is noted at the time of surgery, an attempt should be made to locate the ends of the cord on the side from which the haemorrhage is occurring, by grasping the deep tissue with haemostats and applying gentle traction. Should this prove unsuccessful, the skin incision should be extended into the scrotal sac as this will improve access to the inguinal canal, enabling location of the bleeding stump and application of two secure ligatures.

If the skin incision is extended in this manner, scrotal ablation is necessary to excise the sac and associated dead space, which would otherwise predispose to scrotal hematoma.
Methods of Identification used by VBB for all desexings:

» Ear notching: ‘V’ shaped excision in leading edge of right pinna or out of the tip of the right ear.

» Application of a temporary collar (packing tape or ribbon) marked with the dog’s identification number. ENSURE that the collar is not going to become too tight in young dogs as they grow.

» Tattooing sites: medial aspect of right pinna.
TRANSMISSIBLE VENEREAL TUMOUR

» Early disease: CHEMOTHERAPY
» Moderate disease without complication:
  • If the dog is easily manageable: CHEMOTHERAPY
  • Or: SURGICAL RESECTION FOLLOWED BY CHEMOTHERAPY MAY BE CONSIDERED. SURGERY SHOULD IDEALLY BE PERFORMED UNDER SAME ANAESTHESIA AS DESEXING
» Advanced disease or secondary complication (stranguria, severed secondary infection, myiasis): EUTHANASE

Chemotherapy:
Agent: Vincristine: 0.025 mg/kg i/v: single dose in mild cases; more severe disease will require weekly therapy for four to six treatments.
VETS ONLY TO ADMINISTER VINCRIStINE.

Procedure:
» Wait for at least 4 days post-desexing before treatment.
» Weigh dog & calculate dose of Vincristine required.
» Sedate dog with ½ dose Xylazine.
» Insert IV catheter (not scalp vein/butterfly catheter). Catheter must be placed at 1st attempt.
» Attach to IV administration set & IV fluids (RL or saline). Ensure there is no perivascular leakage of fluids & check that blood flows back into IV line.
» Both veterinarian and assistant must wear protective clothing, gloves, face mask and goggles.
» Draw up calculated dose of Vincristine in 1 or 2 ml syringe.
» Cap needle and ensure needle is tightly attached to syringe.
» Inject Vincristine through IV injection port in administration set, after 1st drawing back IV fluids & again checking blood flows back into IV line.
» Inject Vincristine slowly over several minutes (continue to administer IV fluids while doing so).
» Remove syringe and needle, ensure that needle is capped and place into TOXIC WASTE (empty 5 litres Phenyl container with lid)
» Give remaining IV fluids (500 ml for a large dog, 250 ml for a small dog).
» Remove catheter and dress venipuncture site.
» Place used IV catheter & IV administration set into TOXIC WASTE.
» Remove gloves and wash thoroughly.
» TOXIC WASTE container to be removed by the municipality for disposal when full.
Post-Therapy Care:
» Ensure patient is eating & drinking the following day.
» Administer IV fluids if unwell or dehydrated.
» Patient should be kenneled separately until discharged 2 days after last treatment.
» Protective gloves should be worn when cleaning kennel and when handling dog.
» Inspect injection site for evidence of phlebitis; if noted, dog should be hospitalized and treated (pain relief/debridement if indicated) until a decision is made whether amputation is necessary.
» Advise staff or owner to avoid contact with urine or faeces.
» Urine should be washed away with copious amounts of water. Faeces should be picked up, placed in plastic bag and disposed of in medical waste.
Accurate records are absolutely essential to ensure appropriate care of patients and guarantee that dogs are returned to the location in which they were caught.

**Documentation**

**Required details include:**

- Exact capture location
- Estimated age
- Gender
- Weight
- Category of patient: stray or community dog
- Clinical records: including presence of TVT, pregnancy, mammary mass, etc.
- Release information
POST-SURGICAL CARE AND RELEASE

All dogs are assessed by duty veterinarians at end of working day and at least twice daily thereafter until release; appropriate follow-up treatment is administered, if necessary.

Routine procedures: released after 24–48 hours, if no signs of complication. Exceptions requiring earlier release include lactating bitches and young puppies (see clinical policies).

If aseptic surgical technique not maintained: patient kept under observation for 72 hours: additional antibiotics administered (this should be a rare occurrence if adequate clinical standards are maintained).

Flank spays should be kept hospitalised ideally for 5 days.

It is very important that the kenneling area used to house dogs postoperatively is able to be cleaned efficiently and effectively, and that this is done routinely. This is an important part of postoperative care.

In camp setting: release after 24 hours appropriate if:
» Surgical asepsis maintained
» Sound surgical technique and small incisions utilised
» No complications
» Flank spay
» Midline spay with synthetic absorbable sutures and small wound
» Intra-dermal skin sutures used
» High energy meal eaten before release
» In a well-organised hospital setting, an experienced team of two or three surgeons should perform 20–30 desexing surgeries per day (male and females).
» Requires sufficient, trained and experienced support staff (vet assistants and kennel hands).
» **In camp setting:** it is likely fewer surgeries will be possible in a day.
COMMON SYNDROMES OF SURGICAL SIGNIFICANCE

NB: THIS IS NOT A COMPREHENSIVE LIST, NOR DOES IT COVER THESE SYNDROMES IN DETAIL—please refer to appropriate texts or other VBB materials such as the VetTrain manual and lectures for more information.

Cachexia (emaciated condition):
» Postpone surgery if possible, and feed high protein, high energy meals and multivitamin supplementation, treat parasitic disease
» If not possible:
• Intravenous dextrose saline
• Avoid hypothermia
• Shave and skin prep before anaesthetic induction
• Avoid use of barbiturates

Dehydration:
» Assess percentage dehydration:

4% Dehydrated:
• Skin pliable
• Skin twist disappears immediately
• Skin tent persists for no more than 2 seconds
• Eyes: bright but slightly sunken
• Oral mucosa: moist and warm

8 % Dehydrated:
• Skin leathery
• Skin twist disappears immediately
• Skin tent persists for 3 seconds or more
• Eyes: duller and obviously sunken
• Oral mucosa: sticky but warm

12% Dehydrated:
• Skin: no pliability
• Skin twist persists indefinitely
• Skin tent persists indefinitely
• Eyes: cornea dry; eyes deeply sunken (2–4 mm between eye-ball and bony orbit)
• Oral mucosa: dry, cyanotic, warm to cold
To Correct Dehydration:
• Calculate volume required:
  Multiply the estimated percentage dehydration by the patient’s bodyweight in kg
  e.g.: 20 kg dog estimated to be 7% dehydrated would require:
  20 x 0.07 = 1.4 litres IV fluid to correct deficit
• Must then supply maintenance requirements:
  Approximately 40–60 mls/kg/day
• May have to also provide for abnormal fluid losses (e.g. vomiting, diarrhoea, effusions)

Rate of IV fluid administration:
If no cardiovascular disease, deficit can be replaced as follows:
• ¼ to ½ of the deficit can be administered over 2 to 3 hours
• Remainder of deficit + volume to allow for abnormal losses and maintenance requirements are given over next 24 hours
• NB: If heart disease present: rate must be slowed

In addition to fluid volume lost, one must also consider losses of:
• Electrolytes/Acid-Base balance
• Glucose
• Blood cells
• Clotting factors
• Proteins

Also consider renal perfusion and function

Vomiting (gastric):
Metabolic alkalosis due to loss of H+ and Cl⁻: administer Isotonic Saline

Diarrhoea (small intestinal):
Metabolic acidosis due to loss of HCo3: administer Lactated Ringers Solution

NOTE:
During treatment, Renal Function must be closely monitored
Shock:
Definition: state of very low tissue perfusion, leading to deranged cellular function
Forms: Hypovolaemic, Septic, Vasculogenic, Cardiogenic

Most commonly hypovolaemia secondary to:
» Haemorrhage (external or internal)
» Plasma loss (transudation, exudation, burns)
» Water and electrolyte loss: especially vomiting and diarrhoea

Clinical Signs of Hypovolaemic Shock:
» Depression
» Tachycardia with reduced volume of heart sounds
» Rapid, weak pulse
» Pale, dry mucous membranes (due to peripheral vasoconstriction)
» Prolonged capillary refill time (> 2 seconds)
» Collapsed peripheral veins
» Hyperventilation and tachypnoea: especially when very rapid bleeding is occurring
» Oliguria (urine output < 2 ml/kg/hr)/Anuria: as a result of reduced glomerular filtration rate which occurs when mean arterial pressure is < 60 mm Hg
» Coldness of extremities and footpads

Treatment of Hypovolaemic Shock:
» Should be rapid, aggressive and comprehensive
» Response should be closely monitored

Volume Replacement:
» If PCV > 20: bolus crystalloid (LRS or NaCl) rapidly IV within 15 to 30 min if possible: i.e.: in the absence of cardiac arrhythmia/murmurs.
  • Dogs: 90 ml/kg
  • Cats: 50 ml/kg
» Colloid bolus 20ml/kg
» If PCV < 20: administer whole blood
» Hypothermia must be prevented, but the patient must not be excessively warmed as this leads to vasodilatation and hypotension

NOTE: During treatment, renal function must be closely monitored
Coagulopathy:

**Symptoms may include:** obvious blood loss (e.g. melena, haematuria, epistaxis) or pale mucosae with no history of trauma; visible haemorrhage into mucosae (oral, conjunctival, vaginal); suspicious haematology.

**Action:**
- Assess clotting time:
  - Buccal Mucosal Bleeding Time
  - Clotting Time on glass slide
  - Cut Nail bleeding time
  - Administer whole blood transfusion
  - Administer Vitamin K: only if indicated: e.g. warfarin toxicity

**NOTE:** During treatment, Renal Function must be closely monitored

Renal Failure:

- Assess urine output: volume (closed collection system using indwelling catheter) and parameters:
  - Dipstix Test, Specific Gravity
  - Haematology/Biochemistry
- In the absence of anuria: encourage output via administration of LRS (Retention of H in renal failure leads to metabolic acidosis). Must also observe for signs of hyperkalaemia (increased serum Potassium) in the oliguric patient (signs include weakness/coma/death)
- If severe oliguria or anuria: administer diuretic (IV fluids must be administered very slowly until urine output increases):
  - Mannitol (osmotic diuretic): 0.5 g/kg repeated at 15 min intervals for three doses if required.
  - Furosemide: 5-20 mg/kg (following rehydration)
- Avoid use of NSAIDS if hepatorenal function may be impaired (pre-existing disease/prolonged surgery time/failure to administer intra-operative fluids)
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