Spay/Neuter Training Reference Guide for Veterinarians

A resource guide for your on-site ASPCA Spay/Neuter Alliance training program.

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Chapter 1: Procedural Overview

The surgical procedure itself should maintain a routine sequence of events to assure that each patient is receiving the same standard of care. The surgeon should ensure that the technicians follow a thorough protocol for surgical preparation of the patients, including, but not limited to, complete clip, debris removal, surgical scrub, and bladder expression in females.

As the surgeon approaches the patient in the operating room, a generally accepted practice would be to double-check the status of the patient. Parameters include:

- The patient should be properly connected to the anesthesia machine
- Oxygen and isoflurane levels should be appropriate
- The monitoring equipment should be operational
- It should be confirmed that the patient is at the correct plane of anesthesia and the veterinary surgeon must verify sex of the patient, especially with cats
- Finally, it should be noted that the patient is in proper position for the surgery and that the light source is directed toward the incision site. At this point, the veterinary surgeon may proceed.

The patient is draped in with three or four quarter drapes, with or without a fenestrated drape. Any combination of the above is considered acceptable, as long as there is an appropriate barrier to prevent contamination of the surgical site.
Chapter 2: Tips for Successful Surgical Event

The most important factor in proper surgical technique is that meticulous, careful tissue handling be observed in any procedure. The following additional points will also be emphasized:

- A rigorous ability to maintain sterile technique at all times;
- Incision placement and its importance;
- Removing minimal subcutaneous tissue, which will reduce dead space and facilitate efficient entry into the abdomen;
- Proper and gentle spay hook technique;
- Cutting the ovary away prior to ligation (female dog)/pedicle tie (female cat);
- Using a strangle knot (modified Miller’s knot) and setting using the carmalt;
- Four throws (two square knots) on all sutures - this technique has been proven to decrease the incidence of dehiscence, and must always be used;
- Large bites on the linea alba: include at least 5-to-8 mm rectus tissue in the linea closure in cats and up to 10-to-12 mm in large dogs. A cruciate suture pattern with a surgeon’s throw is used to decrease tension and speed closure time;
- No crushing sutures in closing - linea and subcutaneous tissue should be snugly and completely closed but never crushed;
- Linea and subcutaneous tissue should be closed with polydioxanone (PDS II) suture (see Chapter 9 for discussion on suture material);
- At least three-layer closure: linea, subcutaneous, and subcuticular, plus skin glue (staples are used if skin edges are not apposed);
- Skin edges should be properly apposed - never allow one side to flap over the other or extend above the other. Skin glue should not be applied between the skin edges, but rather on the surface after apposing the edges. Skin glue should only be used as a protective barrier, and never used for “added strength,” or used in place of properly placed skin sutures;
- A tattoo is applied to all patients to ensure no future unnecessary anesthesia or surgery (see Chapter 7).
Chapter 3: Anatomy Review

Anatomy of the Female Reproductive Tract

This illustration depicts the anatomy of the female reproductive tract. Take note of the position and location of the ovaries, the attachment of the broad ligament, and the location at the uterine body in relation to the bladder.

Courtesy: Evans HE, de Lahunta A: Miller’s anatomy of the dog, ed 4, St Louis, 2013, Saunders/Elsevier.
Chapter 4: Incision Placement

The incision placement will obviously vary with both the sex and the species of the patient. We have also determined that varying the incision placement depending on the age of the patient can improve the efficiency of the entire procedure.

- Incisions in adult female dogs are generally placed directly caudal to the umbilicus (Figure 1)
- Incisions in pediatric female dogs are generally placed approximately halfway between the umbilicus and pubis (Figure 2)
- Incisions in adult or pediatric female cats are also placed approximately halfway between the umbilicus and pubis

Figure 1. Adult dog incision placement

Figure 2. Feline/pediatric dog incision placement

- In female dogs, there are several factors which will influence the craniality of your incision placement. The older, larger, heavier, and deeper-chested a dog is, the more cranial the incision should be centered.
- Adult male dogs are neutered with either a pre-scrotal or scrotal incision (however, in pediatric male dogs, the routine approach is scrotal)
Chapter 5: Instructional Videos

A number of instructional videos can be found at www.aspcapro.org/nsnrt, including:

**General**

- Draping Techniques During Spay/Neuter Surgery
- Obtaining Suture & Threading a Needle
- Spay/Neuter Tattoo Application

**Female Dogs**

- Spay Incision Placement
- Spay/Neuter Surgery Techniques (inc. Breaking the Broad Ligament, Canine Suspensory Ligament, Ovarian Cutaway & Ligature Placement, Gravid Uterine Artery Ligation)
- Knots & Ties in Spay/Neuter Surgery (inc. Pedicle Tie, Strangle Knot/Modified Miller’s Knot)
- Closure Techniques in Spay Surgery (Closure for Female Dogs)
- How to Use a Spay Hook During Surgery

**Male Dogs**

- Spay/Neuter Surgery Techniques (Modified Puppy Scrotal Approach)
- Knots & Ties in Spay/Neuter Surgery (Strangle Knot/Modified Miller’s Knot)

**Female Cats**

- Spay Incision Placement
- Closure Techniques in Spay Surgery (Closure for Female Cats)
- How to Use a Spay Hook During Surgery

**Male Cats**

- Knots & Ties in Spay/Neuter Surgery (Strangle Knot/Modified Miller’s Knot)
Chapter 6:
Approach for Scrotal Puppies

**Surgical Field:** Note the entire scrotum has been clipped and prepped for surgery.

1. The surgeon grasps one testicle, positioning it such that the median raphe is elevated and exposed.

2. The incision is made on the median raphe. Both testicles will ultimately be removed through this same incision centrally located in the scrotum. This approach may be used in both pediatric puppy and feline castrations.

3. The testicle is exteriorized using gentle traction.

4. The cord is stripped of any excess tissue or fat. Open or closed technique may be used according to surgeon’s preference.

A **cord tie** or **figure 8 knot** is used to ligate the spermatic cord according to surgeon’s preference. For puppies, the general rule of thumb for determining if the cord can be ligated using one of these techniques is as follows: If the scrotum is not pendulous and the testicular size is no larger than that of a mature tomcat, then these techniques are appropriate. For larger testicles, suture is recommended for ligation. The procedure is repeated for the second testicle and the wound is left open to heal by second intention.
Chapter 7:
Scoring Tattoo

Tattoos are used as an indicator that an animal has been spayed or neutered. This is sometimes called a scoring tattoo, since the skin is scored with a scalpel blade and green paste is then applied, which is a more obvious color, especially on animals with darkly pigmented skin. It is a simple, cost-effective method to ensure the animal never has an unnecessary future exploratory to determine reproductive status. This closure technique prevents patients from licking the tattoo and developing a temporary case of “green tongue” in recovery.

- Both female dogs and cats should have the tattoo placed near the incision site
- Male dogs should have the tattoo placed in the pre-scrotal area
- Male cats should have the tattoo placed where an incision would be searched for in a female cat (as neutered male cats are often misjudged as females)

1. The skin is scored (~1 cm) with a scalpel blade.
2. Paste is applied to the scored tissue.
3. The skin edges are slightly inverted.
4. A drop of tissue adhesive is applied on top of the skin for closure.
Chapter 8:
Ear-tipping

Removing the tip of the ear in community cats is a universal sign permanently identifying the cat as having been spayed or neutered.

1. A straight hemostat is placed perpendicular to the long axis of the pinna, exposing proportionately approximately 1/3 of the ear tip.

2. The ear tip is removed using the straight scissors or scalpel blade to cut over the edge of the hemostats.

3. The hemostats are left in place until hemostasis occurs. A silver nitrate stick can encourage hemostasis.

4. Proper appearance of an ear after being cropped. Note the distinctive straight edge that is easily recognizable from a distance.
Chapter 9: Frequently Asked Questions

Do you prefer clipping or plucking for cat castrations?

We clip for all surgical procedures, including cat castrations. While plucking is an acceptable form of hair removal, we choose to clip these patients to give us a broader hair-free surgical field, which can decrease contamination, particularly in long-haired cats. For us, clipping is also a faster way of preparing the surgical site.

Can I focus on certain procedures during my training?

While we make every effort to provide the types of surgeries that you would like to perform, this is ultimately up to the discretion of your instructor and the types of animals that we have come through the clinic. If your instructor feels that you need work in a certain area, s/he will let you know and will work with you to also incorporate those types of cases. Keep in mind that some cases (such as cryptorchids) are not always available.

Can I take pictures/video of procedures, equipment, setup, etc.?

To protect our patients, we prefer you to NOT take pictures while in the surgical area. If there is a specific piece of equipment you would like a photo of, we may have it already available to view on ASPCApro.org, along with purchasing information. If not, we’d be happy to take a photo for you.

Why do you use polydioxanone (PDS II) suture? Why reels instead of packets?

Simply put, it is the best choice for the high-quality, high-volume spay/neuter (HQHVSN) arena. Suture on a reel is much less expensive than swaged-on suture (suture with the needle attached), and PDS II has the balance of strength and decreased reactivity that is needed in an absorbable suture that is to be used on a large, varied population of cats and dogs. Keep in mind that the body wall takes 2-4 weeks to heal completely after surgery. When you look at the chart below of commonly used suture types, you will see that PDS II retains its strength longer than plain catgut, chromic catgut, and Monocryl TM. Catgut’s short duration of strength and high level of reactivity makes it unsuitable for use in the HQHVSN setting (even on the pedicles, uterine stump, and testicular cords).

Although Monocryl™ has less reactivity in subcutaneous tissue than PDS II, its short duration of strength retention makes it a less than ideal choice for anything but young, fast-healing patients.
Why do you use PDS suture (cont)?

<table>
<thead>
<tr>
<th>Suture</th>
<th>Strength Retention Profile</th>
<th>Absorption Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catgut (plain)</td>
<td>90% lost in 7-10 days</td>
<td>70 days</td>
</tr>
<tr>
<td>Chromic catgut</td>
<td>90% lost in 21-28 days</td>
<td>90 days</td>
</tr>
<tr>
<td>Monocryl™</td>
<td>70% lost in 14 days</td>
<td>100 days</td>
</tr>
<tr>
<td>PDS II</td>
<td>70% lost in 42 days</td>
<td>180 days</td>
</tr>
</tbody>
</table>
Chapter 10:
Resources & Research

Anesthesia - General

- Anesthesia and Pain Management of Shelter Populations
- Anesthesia in Shelter Medicine
- Anesthetic Management in Animal Shelters
- Evaluation of the Clinical Efficacy and Safety of Dexmedetomidine or Medetomidine in Cats/Dogs and their Reversal with Atipamezole
- How Safe is Anesthesia For Dogs and Cats?
- Supplemental Anesthesia & Analgesia Information, Veterinary Task Force to Advance Spay/Neuter
- Webinar: Updates to Spay/Neuter Clinic Anesthetic Protocols (some information may now be outdated)

Anesthesia - Evidence to Support Canine Drug Protocol

- Anaesthetic Induction and Recovery Characteristics of a Diazepam-Ketamine Combination Compared with Propofol in Dogs
- Effect of Dexmedetomidine Vs. Acepromazine-Methadone Premedication on Limb to Lung Circulation Time in Dogs
- Effects of Acepromazine-Morphine and Acepromazine-Methadone Premedication on the Minimum Alveolar Concentration of Isoflurane in Dogs
- Effects of Maropitant, Acepromazine, and Electroacupuncture on Vomiting Associated with Administration of Morphine in Dogs
- Effects of Trazodone on Behavioral Signs of Stress in Hospitalized Dogs
- Heartworm-Positive Dogs Recover Without Complications from Surgical Sterilization Using Cardiovascular Sparing Anesthesia Protocol
- Hemodynamic Influence of Acepromazine or Dexmedetomidine Premedication in Isoflurane-Anesthetized Dogs
- Incidence of and Risk Factors for Postoperative Regurgitation and Vomiting in Dogs: 244 Cases (2000-2012)
- Multivariable Analysis of Anesthetic Factors Associated with Time to Extubation in Dogs
• Randomized Clinical Trial of the Effects of a Combination of Acepromazine With Morphine and Midazolam on Sedation, Cardiovascular Variables and the Propofol Dose Requirements for Induction of Anesthesia in Dogs
• The Use of Trazodone to Facilitate Post-Surgical Confinement in Dogs

Anesthesia - Evidence to Support Feline Drug Protocol

• AAFP Feline Anesthesia Guidelines
• Clinical Efficacy and Safety of Dexmedetomidine Used as a Preanesthetic Prior to General Anesthesia in Cats
• Doppler Echocardiographic Effects of Medetomidine on Dynamic Left Ventricular Outflow Tract Obstruction in Cats
• The Effect of Dexmedetomidine Against Oxidative and Tubular Damage Induced by Renal Ischemia Reperfusion in Rats
• The Effect of Dexmedetomidine on Nutrient Organ Blood Flow
• Effects of a Dexmedetomidine Constant Rate Infusion and Atropine on Changes in Global Perfusion Variables Induced by Hemorrhage Followed by Volume Replacement in Isoflurane-Anesthetized Dogs
• Effects of a Medetomidine-Midazolam-Butorphanol Combination on Renal Cortical, Intestinal and Muscle Microvascular Blood Flow in Isoflurane Anaesthetized Dogs: a Laser Doppler Study
• Effects of a Single Preappointment Dose of Gabapentin on Signs of Stress in Cats During Transportation and Veterinary Examination
• Efficacy of a Single Dose of Trazodone Hydrochloride Given to Cats Prior to Veterinary Visits to Reduce Signs of Transport and Examination-related Anxiety
• Evaluation of the Clinical Efficacy and Safety of Dexmedetomidine or Medetomidine in Cats/Dogs and Their Reversal with Atipamezole
• Evaluation of Dexmedetomidine and Ketamine in Combination with Various Opioids as Injectable Anesthetic Combinations for Castration in Cats
• Evaluation of the Sedative and Cardiorespiratory Effects of Dexmedetomidine, Dexmedetomidine-Butorphanol, and Dexmedetomidine-Ketamine in Cats
• Prepubertal Gonadectomy in Cats: Different Injectable Anaesthetic Combinations and Comparison with Gonadectomy at Traditional Age
• Risk Factors For Anesthetic-Related Death in Cats: Results From the Confidential Enquiry into Perioperative Small Animal Fatalities (CEPSAF)
• Use of Single-dose Oral Gabapentin to Attenuate Fear Responses in Cage-trap Confined Community Cats: a Double-blind, Placebo-controlled Field Trial
Anesthesia - Evidence to Support Reduced Fasting and/or Feeding

- AAFP Feline Anesthesia Guidelines
- The Association of Shelter Veterinarians’ 2016 Veterinary Medical Care Guidelines for Spay-Neuter Programs
- The Effect of Pre-Anaesthetic Fasting Time and Type of Food on Gastric Content Volume and Acidity in Dogs
- Gastro-Oesophageal Reflux During Anaesthesia in the Dog: The Effect of Preoperative Fasting and Premedication
- Incidence of and Risk Factors for Postoperative Regurgitation and Vomiting in Dogs: 244 Cases
- Preoperative Fasting: An Outdated Concept
- Proper Timing for Preanesthetic Fasting

Anesthesia - Evidence to Support NSAID Perioperative Use

- Changes in Platelet Function, Hemostasis, and Prostaglandin Expression After Treatment with Nonsteroidal Anti-Inflammatory Drugs with Various Cyclooxygenase Selectivities in Dogs
- Comparison of Injectable Robenacoxib Versus Meloxicam for Perioperative Use in Cats: Results of a Randomised Clinical Trial
- Comparison of the Analgesic Effects of Meloxicam and Carprofen Administered Preoperatively to Dogs Undergoing Orthopaedic Surgery
- Effects of Meloxicam on the Haemostatic Profile of Dogs Undergoing Orthopaedic Surgery
- Efficacy and Safety of 3 Versus 5 Days of Meloxicam as an Analgesic for Feline Onychectomy and Sterilization
- Efficacy of Tolfenamic Acid and Meloxicam in the Control of Postoperative Pain Following Ovariohysterectomy in the Cat
- Evaluation of Glomerular Filtration Rate in Cats with Reduced Renal Mass and Administered Meloxicam and Acetylsalicylic Acid
- Evaluation of Subcutaneous and Oral Administration of Robenacoxib and Meloxicam for the Treatment of Acute Pain and Inflammation Associated with Orthopedic Surgery in Dogs
- Involvement of Inflammation in Severe Post-Operative Pain Demonstrated by Pre-Surgical and Post-Surgical Treatment with Piroxicam and Ketorolac
- A Retrospective Analysis of the Effects of Meloxicam on the Longevity of Aged Cats with and without Overt Chronic Kidney Disease
• **Robenacoxib Versus Meloxicam for the Control of Perioperative Pain and Inflammation Associated with Orthopaedic Surgery in Cats: A Randomised Clinical Trial**

**Cleaning**

• **UC Davis Koret Shelter Medicine Program: Sanitation in Animal Shelters Information Sheet**

**Community Cats**

• **Alley Cat Allies (organization advocating trap/neuter/return)**
• **American Association of Feline Practitioners’ Feline Retrovirus Management Guidelines**
• **How to Talk TNR**
• **Humane Strategies for Controlling Feral Cat Populations**
• **Shelter Snapshot: Questions About Community Cat Programs**

**FeLV/FIV Testing**

• **Feline Retrovirus Management Guidelines (AAFP)**
• **Humane Strategies for Controlling Feral Cat Populations**
• **Prevalence of Feline Leukemia Virus Infection and Serum Antibodies Against Feline Immunodeficiency Virus in Unowned Free-roaming Cats**
• **Seroprevalence of Feline Leukemia Virus and Feline Immunodeficiency Virus Infection Among Cats in North America and Risk Factors for Seropositivity**
• **Transmission of Feline Immunodeficiency Virus (FIV) Among Cohabitating Cats in Two Cat Rescue Shelters**

**General**

• **Access to Care & the Challenge to Private Practitioners**
• **ASPCA Shelter Intake & Surrender Statistics**
• **ASPCA Spay/Neuter Alliance Standards of Care**
• **Association of Shelter Veterinarians Veterinary Medical Care Guidelines for Spay/Neuter Programs**
• **Characteristics of Clients and Animals Served by High-volume, Stationary, Nonprofit Spay-Neuter Clinics**
• **Feline Fix by Five - Educational Resources**
• **Onset of Sentience: The Potential For Suffering in Fetal and Newborn Farm Animals**
• **Prevention of Fetal Suffering During Ovariohysterectomy of Pregnant Animals**
• **The Role of Private Practitioners in Reducing Numbers of Homeless Dogs and Cats and Shelter Euthanasia Rates**
• **Shelter Medicine for Veterinarians and Staff, 2nd Edition**
• **UC Davis Koret Shelter Medicine Program: Shelter Health Portal**

**Inventory/Controlled Substances**

• **Drug Enforcement Administration - Controlled Substances Act**

**Surgery**

• **Already Been Spayed? Already Been Neutered?**
• **A Comparison of Two Different Suture Patterns for Skin Closure of Canine Ovariohysterectomy**
• **Choice of Suture Pattern for Linea Alba Closure**
• **Optimal Age For Surgical Sterilization of Dogs and Cats**
• **Outcomes of Elective Gonadectomy Procedures**
• **Pedicle Ties Provide a Rapid and Safe Method for Feline Ovariohysterectomy**
• **Scrotal Approach to Canine Orchiectomy**
• **Scrotal Castration Versus Prescrotal Castration in Dogs**

**Workplace Safety**

• **Occupational Safety & Health Administration**