

POST OPERATIVE AND ANESTHETIC COMPLICATIONS

Harold Davis BA, RVT, VTS (ECC) (Anesth.)

"If you don't look, you won't see."

The above quotation best summarizes the goal of post operative/anesthetic nursing care. Veterinary technicians charged with post operative/anesthesia nursing care must be vigilant. We must be able to recognize life-threatening situations and respond to them immediately. If you are not "on the look out" for problems you may not recognize them. The goal of this discussion is to provide the technician with the tools necessary to function effectively in the recovery room/ICU.

Admission to the Recovery Room/ICU

The post operative/anesthetic recovery period begins at the cessation of the operative procedure(s) and/or anesthetic. The recovery period will continue until the patient's physiologic parameters have normalized. When the patient arrives in the recovery area the technician must attend to the ABCs (airway, breathing and circulation), obtain a baseline physical examination and communicate with the surgeon and anesthesiologist.

ABCs

The first priority is to assess the ABCs, airway, breathing, and circulation. Typically, the patient arrives in the recovery area with an endotracheal tube in place. The endotracheal tube should not be kinked or crimped. A tube must be kept clear of secretions such as blood, mucous, and saliva. If the patient is breathing spontaneously, several questions are asked when assessing the patient's ability to breathe. Is the rate and tidal volume adequate? Is the breathing effort smooth and easy or labored? Is the breathing pattern regular? Are you able to auscultate normal breath sounds? Intubation is usually continued until the patient has regained its swallowing reflex and begins to cough or "buck" the tube. In brachiocephalic breeds, extubation is delayed as long as possible and maintenance of airway patency is continuously observed during and immediately following extubation.

Pulse rate, rhythm, and quality, mucous membrane color, and capillary refill time (CRT) are all used to assess the circulatory status. Pulse rate is a non-specific parameter and may be increased (Figure 1) or decreased (Figure 2) for several reasons. Mucous membrane color and CRT are used to assess vasoconstriction and dilation.

Vasoconstriction decreases peripheral perfusion and can easily be recognized by pale mucous membranes (when not due to anemia) and prolonged CRT. Many of the same reasons that cause tachycardia can also cause vasoconstriction. Cyanotic membranes are a late indicator of hypoxemia.

1. Hypovolemia
2. Hypotension
3. Hypoxemia
4. Pain
5. Fever
6. Drugs
7. Excitement phase of recovery

Figure 1 Causes of Tachycardia

1. Drugs
2. Hyperkalemia
3. Severe hypothermia
4. Increased vagal tone
5. Heart block

Figure 2 Causes of Bradycardia

Physical Examination

Once the ABCs have been addressed, a baseline physical examination (PE) should be performed. The initial PE establishes the baseline for further comparisons during the recovery period. In addition to the ABCs, breath sounds are auscultated, temperature obtained, surgical wounds, and dressings, tubes, and catheter sites are inspected.

Communication

Communication is an important factor in the recovery area. As soon as possible the technician should discuss the surgical procedure and the anesthetic period with the surgeon and anesthesiologist. Potential complications and the action to be taken should also be discussed. Orders should be reviewed along with contingencies.

General Post Operative/Anesthetic Complications and Treatments

Agitation/Rough Recovery

Upon recovery, some patients experience an excitatory phase, which is similar to the excitement phase of induction. These patients can often be observed paddling uncontrollably and vocalizing. The goal is to restrain the patient to prevent self-induced trauma. Tranquilization may be an option in some cases.

Prolonged Anesthetic Recovery

Ideally the patient should be able to maintain sternal recumbency and lift its head within several minutes of extubation. In some instances patients will take an unexpectedly long time to recover. There are two general causes for prolonged recovery; either patient or anesthetic related causes. Patient related causes may be due to poor perfusion, hepatic, renal or intracranial disease, and hypothermia. Anesthetic related causes include excessive anesthetic depth and breed predisposition. In the case of prolonged recovery steps can be taken as needed to speed up the patient's recovery. Fluids may be given to enhance perfusion; manual ventilation with 100% oxygen to enhance the elimination of anesthetic gases; or anesthetic drugs may be reversed. Caution should be used with regards to physical stimulation. It is possible to stimulate an animal to the point of extubation and once extubated it returns to sleep. If physical stimulation is used the nurse needs to be sure that the patient can protect its airway, remain sternal and lift its head.

Aspiration Pneumonia

Patients at risk for aspiration pneumonia are those that have esophageal (megaesophagus) or gastric fluid accumulation, and then either regurgitate or vomit during recovery. When this problem is anticipated, the esophagus and stomach should be suctioned to prevent aspiration

If the animal is in lateral recumbency and begins to vomit, lower the head and neck and hold the mouth open (don't get bitten). Once the vomiting has passed, assess the mucous membrane color, respiratory rate, and breath sounds, suction and or swab the oral cavity (again, don't get bitten).

Hypoxemia

Reasons for hypoxia are listed in Figure 3. The most common reasons that may be encountered in the recovery period include airway obstruction, aspiration pneumonia or ventilation perfusion mismatch. Low ventilation perfusion mismatch occurs when there is flow past non-functional alveoli. Significant pulmonary congestion may be present in the “down lung” after prolonged lateral recumbency. In most instances the removal of the airway obstruction, administration of oxygen, positive pressure ventilation with or without positive end expiratory pressure may be used to treat hypoxemia.

1. Hypoventilation
2. Ventilation perfusion-mismatch
3. Right to left shunt
4. Diffusion impairment
5. Low inspired oxygen.

Figure 3 Causes of hypoxemia

Hypothermia

Anesthetic drugs can affect the normal thermoregulatory process. Heat loss through an open chest or abdomen contributes to hypothermia. Smaller patients have a greater surface to volume ratio and are more susceptible to hypothermia. Every effort should be made to return and or maintain a patient in a euthermic state. Warm water circulating, or forced hot air blankets and drapes or towels are effective tools for correcting hypothermia.

Hyperthermia

Hyperthermia may be a result of rough recovery, ketamine administration in dogs or myelography. Placing the patient on a cage floor, wetting with tepid water or directing fans at the patient are all options for correcting hyperthermia. Tranquilization may be helpful in patients that are agitated. Because severe hyperthermia can result in increased oxygen consumption, oxygen should be administered. Crystalloids help to improve circulating blood volume and cool the patient.

Development of malignant hyperthermia has been reported in the dog, horse and pig. This disease process is a genetically determined disorder of muscle metabolism. It is associated with halothane administration but can be triggered by any anesthetic. If suspected, the offending anesthetic is discontinued and aggressive action is taken to lower the body temperature.

Hemorrhage

The surgical incision should be monitored during recovery. Excessive bleeding at the surgical site, increase in abdominal girth along with clinical signs suggestive of hypovolemia (pale mucous membranes, prolonged refill time, tachycardia, and poor pulse quality) could be indicative of internal bleeding. The causes for bleeding could be due to a slipped ligature, bleeding from small arteries that were not bleeding during closure or a coagulation disorder. Direct pressure should be applied and the doctor informed. The clinician may elect to perform an ultrasound and or perform an abdominocentesis or thoracentesis. Therapy may consist of continued direct pressure, fluid resuscitation and or surgical reexploration.

Hypotension

Anesthetic drugs can have a negative inotropic effect on the cardiovascular system. However, the most common cause of hypotension is hypovolemia. Induction of general anesthesia can unmask pre-existing fluid deficits. Therapy is indicated when the systolic and mean blood pressure approach 80 and 60 mmHg respectively. Therapy is directed at correcting fluid deficits either through the administration of crystalloids (50 - 55 ml/kg and 80 - 90 ml/kg in the cat and dog respectively), colloids (10 - 40 ml/kg) and 7.5 % hypertonic saline (4 - 6 ml/kg). Blood products are given to maintain a packed cell volume greater than 25% and/or the total protein greater than 3.5 g/dl. In those situations where fluid support is not sufficient sympathomimetics such as dopamine or dobutamine should be considered.

Cardiac Arrhythmias

Perhaps the most common arrhythmias observed in the recovery area are ventricular in origin. Treating the underlying cause, and in some instances oxygen supplementation and improved ventilation may help correct ventricular arrhythmias. If ventricular tachycardia is the problem, drug therapy may be indicated. Anti-arrhythmic therapy is indicated if the heart rate exceeds 180 bpm, the patient is cardiovascularly compromised, or the patient has multiform PVC's. Lidocaine is generally considered the drug of choice for treating ventricular tachycardia. It is initially given as a bolus at a dose rate of 1 – 4 mg/kg over 1 – 3 minutes in the dog. If the patient is responsive to the bolus it is then followed by a constant rate infusion of 40 – 100 µg/kg/minute IV. The bolus dose in a cat is 0.5 mg/kg slowly. Response to therapy can be the total abolishment of the PVC's, a reduction in the number of PVC's, a slowing of the rate, or improvement in the overall cardiovascular status.

Cardiopulmonary Arrest (CPA)

CPA is defined as the sudden cessation of functional ventilation and effective circulation. CPA may be a result of any disease process which disrupts cardiac and/or pulmonary homeostasis. Potential causes of cardiopulmonary arrest include hypoxia, shock, metabolic disorders, trauma, vagal stimulation, anesthetic or other drugs and environmental influences (hypo or hyperthermia).

The existence of cardiac arrest must be recognized early if we are to effectively resuscitate the patient. In the wake patient consciousness is lost within 10-15 seconds. In the anesthetized patient a declining blood pressure will be one of the first signs you will see. Other signs include the absence of a palpable pulse or audible heart sound, the absence of breathing effort (agonal breaths should not be considered effective breaths) and fixed and dilated pupils. If there is any question that CPA has taken place the patient should be treated as such until proven otherwise.

The goal of cardiopulmonary-cerebral-vascular resuscitation is to provide adequate ventilatory and circulatory support until spontaneous functions return. Once it is determined that CPA has taken place an airway is established and the patient is ventilated once every three to five seconds. Chest compression is begun at a rate of 80 - 120 compressions per minute. IV access is obtained either peripherally or centrally and in some cases intraosseous. Epinephrine and atropine are used in the treatment of asystole. Defibrillation is indicated when the patient has ventricular fibrillation. CPA is a rapidly

vasodilating disease therefore, fluids should be given rapidly intravenously, in aliquots sufficient to maintain effective circulating volume.

Summary

The goal of post operative/anesthesia care is to insure a safe and normal recovery of the patient. As discussed, there are several aspects of post operative/anesthesia care that the veterinary technician must be prepared to manage. One prospective multi-center study determined that the postoperative period was the most common time for dogs and cats to die. Further, it showed that the most frequent time of death occurred within three hours of the termination of the operative procedure¹. Cardio respiratory was the most common cause of death in dogs and cats. This reinforces the idea that vigilance is important in the immediate postoperative/anesthesia period. While not ignoring the other body systems the cardio respiratory system is of great importance.

References

1. Broadbelt DC, Blissitt KJ, The risk of death: the confidential enquiry into perioperative small animal fatalities. *Vet Anesth and Analge*, 2008 ;35: 365 - 373