

5: MINIMISING COMPLICATIONS

PREVENTION IS BETTER THAN CURE

- Anaesthetic emergencies should be rare - most can be prevented by preparation and by thinking ahead
- Anaesthesia has been likened to flying – the “pre-flight check” prevents emergencies
- Use a pre-anaesthetic check list Anaesthesia records & checklists : Association of Veterinary Anaesthetists (www.ava.eu.com)
- Examine the patient and anaesthetic equipment before anaesthesia. Make a plan (see infographic 1)
- General anaesthesia depresses all vital function – this is the most likely cause of complications
- The procedure to be carried out may have its own potential complications:

Dental surgery

- Risk of fluid aspiration
- Mouth open too wide cuts off circulation to brain (eg spring-loaded mouth gags in cats)

Intestinal surgery

- Risk of gastroesophageal reflux, vomiting, aspiration

Thoracic surgery

- Risk of compressing the lungs (hypoventilation and hypoxaemia)

Dehydrated/shocked animal

- Risk of circulatory failure – restore circulation first

Abdominal surgery

- Risk of pressure on vena cava impeding venous return – especially Caesarean section and gastric dilation volvulus

Head & neck surgery

- Risk of kinking the airway, vagal stimulation, bleeding

Monitor closely. Good monitoring detects abnormalities and enables it to be corrected or treated before it becomes a serious complication (see infographic 4)

Airway obstruction

- Causes death through suffocation if complete
- Brachycephalic breeds are prone to airway obstruction due to the Brachycephalic Obstructive Airway Syndrome (BOAS), especially after airway surgery. Prepare a difficult airway kit and be prepared to reintubate during the recovery period if required
- Partial airway obstruction causes insidious hypercapnia. Common causes include - kinked endotracheal tube, secretions, inflamed airways. Less common – laryngospasm
 - Signs: laboured attempts to breathe leading to cyanosis (hypoxaemia), looks as if anaesthesia is too light, an animal anaesthetised too deeply may just stop breathing
 - Capnography may allow early detection of airway obstruction, look for changes in the capnogram (see infographic 4)
 - Treatment:
 - Clear the airway.
 - Check the endotracheal tube integrity.
 - (Re)induce anaesthesia and (re)-intubate and administer oxygen

Laryngeal spasm

- Most common in cats – all manipulations should be gentle in this species including laryngoscopy – do not touch the arytenoids
- Use topical local anaesthetic spray (2% lidocaine), then wait 30-60 seconds before attempting to intubate
- Don't keep trying to intubate
- Treatment
 - Deepen anaesthesia
 - Topical local anaesthetic (0.1 mLs lidocaine 2% - wait 30-40sec before attempt to intubate)
 - Oxygenation; if it is partial spasm, it may resolve
 - Laryngotomy (cats 14G hypodermic needle through base of larynx) or neuromuscular blocker as a last resort
 - Laryngeal spasm may occur at extubation as well as during intubation

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Apnoea or bradypnoea

- Inadequate respiration is difficult to detect clinically, it may be insidious and leads to hypoventilation
- Apnoea – ventilate immediately while finding the cause
- Bradypnoea – may also need ventilating – use SpO₂ & ETCO₂ for guidance
- Hypoxaemia is unlikely if oxygen is the sole carrier gas for a volatile anaesthetic, **unless apnoea develops**
- Low SpO₂ on pulse oximeter indicates hypoxaemia (or poor peripheral circulation - see below)
- Hypoxaemia causes inadequate tissue oxygenation
- Aspiration of stomach contents may be unnoticed and leads to slowly worsening hypoxaemia. Ensure snug-fitting endotracheal tube cuff (no leaks) and pack pharynx for high risk cases
- Causes of hypoventilation or bradypnoea potentially leading to poor oxygenation (hypoxaemia) include; compression of the chest, airway obstruction, pulmonary oedema, hypothermia and pain
- Treatment for hypoxaemia:
 - Increase inspired oxygen.
 - Ventilate.
 - Suction trachea.
 - Remove anything compressing the lungs (including external pressure on the thorax).
- Inadequate respiration leads to hypercapnia, respiratory acidosis, cardiac dysrhythmias
- Hypercapnia is difficult to detect – use capnograph
- Pulse oximeters do not measure CO₂. The patient can be adequately oxygenated but still hypercapnic if breathing oxygen-enriched gases
- Treatment for inadequate respiration and hypercapnia :
 - Ventilation.
 - Reducing the anaesthetic depth.
- Does not matter how ventilation is given: manually by squeezing re-breathing bag, mechanical ventilator, or even blowing down the endotracheal tube (if other sources not available)

Failing circulation

- Bradycardia leads to low cardiac output, poor tissue perfusion
- Treatment of bradycardia:
 - Decrease the depth of anaesthesia
 - Administer an antagonist drug such as atipamezole (if appropriate for alpha2 adrenoceptor agonists xylazine, medetomidine & dexmedetomidine)
 - Administer an anticholinergic (atropine, glycopyrrolate) if vagally-induced bradycardia (caused by opioids or e.g. during ophthalmic or gastrointestinal surgery)
- In cases with blood/fluid loss, assess pre-operative needs from history, physical examination (% dehydration), haematocrit and total protein. Keep up replacement of ongoing losses during surgery – count swabs, measure fluid in suction bottles and supply daily maintenance requirements (at least 2 ml/kg/hr)
- A fluid therapy plan (accounting for dehydration + maintenance requirements + ongoing losses over 12-24h) should be in place to ensure tissue perfusion and oxygenation, especially in hypovolemic/septic patients. Fluid boluses (5-10 mL/kg IV) over 15 min may be required
- Dysrhythmias are only a problem if they compromise cardiac output/blood pressure or are increasing in severity and may lead to ventricular fibrillation. Treatment of dysrhythmias requires ECG diagnosis
- All dysrhythmias will be improved by ensuring normal oxygenation, eucapnia, adequate hydration/perfusion, normal electrolytes and reduced/removed volatile anaesthetics
- Treatment of dysrhythmias:
 - Lidocaine IV (2-4 mg/kg) is the first line of drug treatment for most dysrhythmias.
 - Acepromazine reduces the likelihood of sympathetic - induced ventricular fibrillation and can be used even during anaesthesia (as well as premedication). However, it may cause irreversible hypotension due to peripheral vasodilation.
 - Ventilating to normal ETCO₂, ensuring oxygenation, adequate fluid therapy and removing volatile anaesthetic agents is the main thrust of treatment.

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FECAVA BASIC PRACTICES IN VETERINARY ANAESTHESIA AND ANALGESIA

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Abnormal temperature

- Hypothermia may cause failure or delay to recovering consciousness. If severe it may cause cardiac abnormalities.
- Treatment:
 - Insulation
 - warm IV fluids
 - warm environmental temperatures
 - bubble wrap
 - heated blankets
 - forced air warming devices.
 - Ensure adequate respiratory and cardiac function during warming
- Hyperthermia - malignant hyperthermia is rare. It is more common in brachycephalics/long-coated breeds maintained on closed circuits in hot environments
 - Signs are insidious during anaesthesia – only detected by monitoring
 - Less common – drug-induced (high-doses of hydromorphone in cats or ketamine-based protocols in rare cases)

Treatment

- Cool with cold water, ice and fans - make use of evaporation; Antagonise opioids if they are implicated but remember this will also reverse analgesia

Complications also occur during recovery

- Monitoring must continue until the patient is normothermic (at least 37°C), can protect its airways, consciousness is returned and ideally can eat and drink. Most anaesthetic deaths occur in the recovery period (up to 3h after extubation)

Cardiopulmonary resuscitation

Refer to the RECOVER guidelines for drugs, content of emergency box and CPR strategies

<https://recoverinitiative.org/cpr-guidelines/current-recover-guideline/>:

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