WILDLIFE ANAESTHESIA

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ANAESTHESIA IS COMPLEX

ANAESTHESIA is a state of insensibility due to neuronal blockade and/or reduced activity. It may be general, affecting the whole body with progressive depression of the central nervous system, or local, affecting a part of the body. Local anaesthesia may be topical (eye, skin), infiltration (skin small area), field block (dental, digital, hoof, intercostal) or regional (spinal, epidural).

Provision of adequate anaesthesia depends on a high level of understanding of physiology, biochemistry, physics, anatomy, pharmacology, pathology, psychology and microbiology.

The history of anaesthesia is a process of development of better understanding of applied physiology and pharmacology. Modern anaesthesia is a magnificent outcome of that, at times, painful process. We are very fortunate. There have been medications, techniques and myths that have been discarded during the past 100 or so years, resulting in the high-quality anaesthesia that is possible today. When myths and/or misunderstandings persist, it is usually the patient that suffers. For example; the use of diazepam alone to enable performance of painful interventions is inappropriate. Giving a large dose of a sedative may reduce patient activity but pain perception is intact and may generate a chronic pain syndrome, psychological injury and poor outcomes that may be long standing or permanent.

There are many factors that affect all types of anaesthesia. Species differences, age, gender, season, environmental temperature, physical and mental health and any current medications all affect and dictate the type of anaesthetic that may be appropriate for any individual. As with any other medication, anaesthesia must be specifically formulated for each individual.

Prior to any anaesthesia, assessment of the patient clinically will dictate the necessity for further investigation such as haematology, biochemistry, radiography, ultrasonography and/or electrocardiography. If the patient is unwell it may be possible to delay the anaesthetic until steps have been taken to enhance their health status. They may require rehydration or relief of pulmonary congestion or treatment for pneumonia or blood transfusion or adequate pain relief or treatment of hypoglycaemia or hypothermia or all of those corrections. The environmental circumstances are also critically important. The patient and/or the anaesthetic may be compromised by the environmental temperature. Excess heat or cold shall be reflected in the patient's body temperature as hyperthermia or hypothermia. High fever or metabolic failure shall similarly have a negative impact.

The anaesthetic method to be used (general or local or both), type of medication, combinations of medications, route of administration, duration of anaesthesia required (brief for drawing blood, longer for radiography or abdominal paracentesis, long for laparotomy),

type of procedure (orthopaedic surgery, closed reduction of fracture or dislocation, soft tissue surgery), all must be considered.

There are many different medications used for managing anaesthesia and pain. These medications are individual in their indications, duration of activity, potential side effects, dose rate, potential use in combination with others, ability to affect pain perception, respiratory depression, blood pressure and all aspects of physiology. Some medications are known to be effective analgesics (morphine, ketamine, tramadol) whereas others are useful for sedation but not analgesia (diazepam). Some provide useful analgesia in different species (tramadol). Some medications are used in combination to enhance analgesia (multimodal analgesia) for example an opiate plus ketamine plus a NSAID or corticosteroid, plus paracetamol plus local anaesthesia.

For most significant procedures a combination of agents will be used to enact balanced anaesthesia. For example, for a major orthopaedic operation, following proper patient assessment, a premedication using one, two or three drugs will then be followed by induction and maintenance. During the procedure it may be appropriate to add further analgesia or other medications.

At each stage of this process acute vigilance is necessary. Any departure from the expected progression of the anaesthesia shall be assessed and modified as necessary. Monitoring is routine at all stages. The original and still essential method of monitoring is clinical. Much information can be gathered from the patient in the absence of machines. “When all else fails look at the patient”. Adequacy of ventilation (breathing), circulation (pulse rate, pulse pressure, heart rhythm, mucosal colour, capillary refill), body temperature, responsiveness, ocular signs indicating anaesthetic depth are easily determined.

There is a variety of monitoring equipment to enhance clinical appraisal. Some of these are considered standard and essential. Others may be useful in special circumstances. Examples are;

Pulse oximetry for pulse rate, pulse pressure, rhythm and oxygen saturation in the blood.

Ventilation monitoring to inform about breathing rate and duration of pauses between breaths. eg ‘Apalert’ monitor

Capnography to determine the level of carbon dioxide expulsion from the lungs and body.

ECG (electrocardiography) to display cardiac rhythm.

Temperature – external and/or internal

BIS (a modern form of CNS monitoring by way of brain wave patterns similar to EEG to determine level of consciousness) to follow CNS (central nervous system) level of responsiveness

Blood pressure. May be arterial pressure externally or invasive. May be central venous pressure.

Others including level of gas input and output (oxygen, carbon dioxide, volatile anaesthetic agents), tidal volume (level of ventilation/breathing), ultrasound, urine output.

All of these may assist in maintaining safe and effective anaesthesia as long as they are used appropriately. Total reliance on monitoring equipment without associated clinical reference can be misleading and potentially dangerous.

Adjuncts to balanced and physiologically adequate anaesthesia include any additional medication or other interference that enhances safety, pain management and patient comfort prior to, during and post anaesthesia.

Management of hydration, blood pressure, circulation, urine output, pain, temperature, hypoglycaemia, hypercapnia (increased carbon dioxide retention) and acidosis, pressure areas, atelectasis (collapsing alveoli in the lung), sepsis at dependent sites and intravenous cannula sites, corneal drying causing keratitis or corneal ulceration, excess salivation, regurgitation with or without aspiration into the airway, and other unforeseen events are part of anaesthetic responsibility.

In veterinary medicine there is a large diverse range of patient species for which anaesthesia is provided. That range includes mammals, birds, reptiles, amphibians and fish. Each of these groups requires of the anaesthetist a thorough understanding of all the basic characteristics outlined above eg physiology and pharmacology. Within each group there are significant species differences regarding techniques, medications, induction and management.

For example, general anaesthesia for a horse or large kangaroo presents difficulties of size, induction, ventilation and recovery that are less problematic for dogs or small kangaroos. Ruminants are more prone to bloat because eructation may be limited. Some species, e.g., cats, require prophylaxis for laryngospasm but any patient may suffer a life-threatening laryngeal spasm pre or post endotracheal intubation.

Wildlife patients generally are prone to stress of a greater magnitude, and a potentially more serious outcome than domestic species. The level of stress may be clinically subtle or very obvious. One must always consider that stress in wildlife patients is present and significant. Manifestation may be frantic attempts to hide or avoid contact, acute onset diarrhoea, rapid or irregular heart rate and/or respiratory rate, shedding of feathers, change of body colour, attack, vocalization, collapse, convulsion, sudden death and more.

A considered approach to wildlife anaesthesia depends on the situation, the patient, the proposed procedure, likely situation for anaesthetic recovery, patient morbidity and comorbidities.

Respectful management may include the following.

Quiet, non-threatening and respectful initial approach to the patient. The first contact with any patient is the one that they are likely to remember and that encourages compliance, noncompliance and/or anaesthetic difficulty or otherwise.

Appropriate premedication is usually advantageous for both the patient and anaesthetist. It is often a combination of medications each of which is designed to provide a pharmacological and physiological benefit. For example, there may be a sedative plus an analgesic and/or a dissociative agent. They may be delivered by hand held or remote injection or orally. Sometimes more than one route of administration is necessary. Adequate premedication helps to calm the patient and relieve existing pain but also pays dividends during and post anaesthesia by enhancing anaesthetic maintenance stability and a smooth recovery. Allowing calm intravenous access is vital in some species eg macropods, so that anaesthetic induction can be achieved intravenously so avoiding the complications of volatile (gaseous) induction ie catecholamine (adrenaline) surge with consequential cardiac arrhythmia and acute cardiomyopathy. In reptiles, premedication allows more certain subsequent volatile (gaseous) induction and helps to mitigate against apnoea (breath holding). Venomous patients may be more compliant if provided with premedication that reduces stress for the patient and the anaesthetist.

Anaesthetic maintenance may be achieved by intravenous, volatile (gaseous) using a mask or endotracheal tube and/ or employing local anaesthesia (nerve block, epidural, spinal, intralesional). Other than the primary anaesthetic agent used, medications such as analgesics, long or short acting local anaesthetics, drugs to control complications of blood pressure change, cardiac rhythm, dribbling, bronchospasm, etc., are used to provide a stable anaesthetic and enhance a smooth recovery.

Fluid therapy during anaesthesia provides for physiological maintenance and correction of adverse changes. There are many types of fluid available for such therapy and the type, volume, rate of administration, temperature are the province of the anaesthetist. For example, very young patients have limited glucose/liver glycogen reserves and require supplementation prior to, during and post anaesthesia. Neonates should be fasted for less time than adults. Potassium containing fluids may become problematic in patients with existing or who are prone to myopathy or those suffering burns, particularly if serum potassium levels are not available immediately prior to, during or post anaesthesia. Conversely patients with long standing diarrhoea may be deficient in potassium (and glucose, water, sodium, calcium, protein, etc.).

Pain management is of critical importance prior to, during and post anaesthesia. The presence of pain has significant short and long-term consequences. Pain in the conscious patient is unpleasant, may provoke a more difficult and unstable anaesthetic, create an unsettled, stormy and stressful post-operative course and may promote a long term neuropathic pain syndrome. Such an outcome may severely disrupt a timely rehabilitation. There are numerous medications and techniques to provide analgesia. They include analgesics such as opiates, dissociative agents, centrally acting stimulants, anticonvulsants, antidepressants and local anaesthetics. There is a legion of techniques available for their administration. They may be infused, applied topically, injected into skin, muscle, joints, bone, spinal canal, around nerves and/or given orally. Adequate analgesia is not restricted to a single method. Multimodal analgesia is available and should be utilised to enhance an intraoperative and post-operative pain free course. Physical pain management techniques such as splinting enhance analgesia.

Pre-emptive analgesia is considered important. Pain should be treated early and regularly so that analgesia is more effective and ‘windup’ is precluded. Once severe pain is established then ‘catch-up’ becomes necessary and larger doses of analgesics become necessary and/or the pain may never really be controlled, leading to the possibility of neuropathic pain. As with any medications all analgesics have potential side effects that vary depending on all the physical and physiological attributes of each patient. There are species and age differences that guide analgesic choice. The type of injury (including operative injury), psychological parameters (eg stress, fight or flight response), cardiovascular and respiratory status (high or low blood pressure, rapid or slow heart rate, breathing difficulty, etc), already administered medications (other analgesics, anaesthetics, sedatives, tranquillizers, corticosteroids, antihistamines, anticonvulsants, etc.) all influence subsequent treatment.

Post anaesthetic attention to detail and vigilance are essential attributes of good quality anaesthesia. Many of the above considerations continue during recovery and beyond into consciousness. Neglect of patient needs at this stage is irresponsible and may allow consequences that are unpleasant or even life threatening. Haemorrhage, laryngospasm, regurgitation (and aspiration), pain, hypoxia (lack of adequate oxygen), self-excoriation or injury, head injury, hypothermia, hypoglycaemia, hypotension (low blood pressure) are a few possibilities.

Good quality, adequate, balanced anaesthesia requires that the patient be treated with respect and that appropriate techniques, medications, vigilance and follow up are applied. Wildlife patients should not be denied proper care and access to modern veterinary medicine including high quality anaesthesia. They deserve due diligence for best outcomes. Rehabilitation and ultimate return to the wild rely on us.

CONCLUSIONS

Have respect for all patients
‘Difficult’ patients may be stressed and/or suffering pain and/or hypoxia
Everything affects everything else
If in doubt, don’t
Sedation is not anaesthesia
Sedatives are not analgesics although some analgesics provide sedation
Pain is unpleasant
Pain is unacceptable
Pain can be managed
Pain has negative consequences
Veterinary attention is critical for best outcomes
Animal welfare is high priority
‘Knocked out’ is not anaesthesia
Anaesthesia is not a recipe