RABBIT ANAESTHESIA: HOW TO KEEP THEM ALIVE! – ELISABETTA MANCINELLI

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Introduction

The aim of a general anaesthetic is to provide adequate restraint to allow examination, minor or surgical procedures, to obtain muscle relaxation, amnesia and appropriate pain relief. Anaesthetizing rabbits is becoming more and more common in our day to day practice in order to perform a variety of clinical procedures. However, a recent study reported an overall perianaesthetic mortality rate of healthy pet rabbits of 1.39%, values that are 5 times higher than those found in dogs and cats but represent an improvement compared to data reported in an earlier 1990 study where the mortality rate was 1 in 28 rabbits. Furthermore, recent advances in techniques and equipment and availability of new and safer drugs have allowed veterinarians to apply higher standards to these species as well. Anaesthetising rabbits can certainly pose a challenge but the risks can be minimised and mortality decreased, increasing the chances of a positive outcome.

Pre-anaesthetic considerations

Rabbits and rodents are prey species and they are therefore masters at disguising signs of disease. This means that they hide pain well and are often presented in advanced stage of illness. A careful pre-anaesthetic evaluation is therefore essential. This should include a detailed history (e.g. information regarding husbandry, diet, past and current medical history), a complete physical examination and a minimum laboratory database (e.g. packed cell volume (PCV), total protein (TP), blood urea nitrogen (BUN), creatinine, blood glucose) which will provide useful information on the health status of the patient which is going to be anaesthetised. Arterial blood gas analysis should be considered a routine and superior tool for evaluation of acid-base status, electrolytes, ventilation and oxygenation in rabbits.

The American Society of Anaesthesiologists (ASA) provides a classification system which is worth reviewing for rabbits too as it may help evaluating whether a patient is fit for an anaesthetic (grade 1-2) or higher risks may be anticipated. The peri-anaesthetic death risk increases for higher ASA grades. A throughout physical examination may be able to pick up subtle signs that may have been missed by owners and may lead to further investigations and postponement of the anaesthetic. The clinical evaluation also allows determination of those baseline parameters (e.g. heart rate, respiratory rate, body temperature) which represent the expected normality and reference points for that particular individual. Those will be the parameters constantly monitored, maintained during the anaesthetic and to which the clinician aims to return at the end of the procedure.

These parameters should be marked on the anaethetic sheet as pre-anaesthetic parameters and should be maintained during and after the anaesthesia. Many species can become when stressed when handled and this may need to be taken into consideration. The following factors, which may complicate an anaesthetic procedure, should be considered: the presence of underlying disease, inappropriate husbandry and diet, lack of confidence and expertise of staff involved, anatomical and physiological differences compared to more common species, drug dosages, inadequate pain relief and post-anaesthetic care. Furthermore, as rabbits are higher risk patients, minimising the length of the anaesthesia is crucial. This is done by adequately preparing the procedure (including all drugs and equipment needed as well as an appropriate emergency plan) is every detail.

Unhealthy animals should be stabilised before undergoing an anaesthetic procedure (e.g. fluid therapy started to correct dehydration, assisted feeding commenced in anorectic patients, antibiotic administered if required and pain relief provided). Rabbits have high metabolic rates and small glycogen reserves therefore prolonged fasting (e.g. prior to surgery) or anorexia may predispose them to hypoglycaemia. If assisted feeding is provided, this should be stopped 30 minutes before the rabbit is given any premedication, sedation or anaesthesia to reduce the risk of food accumulation within the oropharynx which may interfere with intubation. Vascular access is strongly advised in any rabbit hospitalised and/or undergoing an anesthetic. This is required both for fluid administration and delivery of anaesthetic and/or emergency drugs. Where an intravenous access is not possible, in collapsed patients or in emergency situations, the intraosseous route can be taken into consideration.

Anaesthesia

The concept of “balanced anaesthesia” is based on the administration of small doses of several drugs which will still provide appropriate analgesia and anaesthesia required for a certain procedure but with the added advantage of reduced side effects associated with each of the drug used. The idea is that smaller doses will interfere less with the animal physiology and allow a faster recovery. This overcomes the disadvantages associated with the administration of high doses of only an inhalational or an injectable agent. For example, a sedative/analgesic combination may be given during the premedication/induction phase to allow sedation, reduce the stress associated with handling, help with muscle relaxation, provide analgesia, and facilitate administration of a volatile agent which can then be used for maintenance. Availability of reversal agents further adds to these benefits. Pre-anaesthetic and sedatives commonly used in small exotic mammals have been revised elsewhere (please refer to the literature provided).

The choice of the most appropriate anaesthetic protocol will largely depend on personal preference and familiarity with each of the drugs, the health status of the patient, and procedure to be performed. Whatever the choice and the situation, it is always important to routinely pre-oxygenate the patient to reduce the risks of hypoxia (especially during induction and intubation).

It is recommended to provide oxygen via tight fitting mask (where this is not too stressful for the animal) rather than by placing the animal in an oxygen tent or holding the oxygen source directly in front of the patient's nose, as these effects are rapidly lost. An oxygen reservoir may be created in <1 minute of high inspired oxygen concentration in healthy patients but it may take longer than 5 minutes in animals with compromised respiratory function.

Anaesthesia may be induced via subcutaneous (SC), intramuscular (IM) or inhalational drug administration. Each of these methods has advantages and disadvantages. Inhalant agents alone, either administered via face mask or induction chamber, are generally not recommended in rabbits because this method is too stressful, patients can breath-hold (leading to hypoxia, hypercapnia and bradycardia) and struggle potentially injuring themselves. Some induction protocols may be sufficient to provide short term anaesthesia but in the majority of cases and for prolonged procedures, volatile agents are used for maintenance of anaesthesia.

Isoflurane, sevoflurane and desflurane are the gas anaesthetics more commonly used. Their advantages, disadvantages and effects in small mammals have been revised elsewhere (refer to the literature provided). The most commonly used circuit for small mammal anaesthesia is the Ayre's T-piece, which has the advantage of low resistance and little dead space. However, other non-rebreathing systems (Bain, Mapleson, Magill, Jackson-Rees, Normal elbow) are available. The gas flow rate is typically 3 times the minute volume of the rabbit (tidal volume, 4-6 ml per breaths per kg, multiplied by the respiratory rate, 3060 bpm).

Intubation

One study has reported that only 29% of rabbits anaesthetised in general practice in UK are intubated. However, airway protection is strongly recommended for any anaesthetic procedure, wherever possible. Rabbits have a small oral opening, the distal end of the tongue is muscular and occupies the majority of the space in the mouth, the larynx is deep within the oropharynx. These anatomical features make intubation of this species challenging.

Various techniques for intubation are available for use in rabbits. Beyond the traditional oro-tracheal intubation (direct visualisation of the glottis with a laryngoscope, otoscope or endoscope; or blind technique), nasal intubation, nasotracheal intubation, tracheal intubation via tracheostomy can be chosen depending on species, patient's size and clinical conditions, personal preference or emergency situation.

When choosing the traditional oro-trachel intubation, the following considerations should be done. Ideally the tube should be two thirds of the diameter of the trachea or close to the diameter of the glottis. Excessive escape of anesthetic gases can occur if inappropriate size tubes are used. Non-cuffed, clear, 2.0 to 5.5 mm endotracheal (ET) tubes are normally used in rabbits, depending on size. If a cuffed tube in used, in bigger patients, caution should be used. Never use force to slide the tube down the larynx to prevent trauma and possible oedema or haemorrhage. The tube should be pre-measured so that it extends no more than 1 cm past the larynx. Haemoglobin oxygen saturation level (SPO2) and mucous membranes colour should be monitored during intubation. Topical application of 0.05 ml to 0.1 ml lidocaine 2% (Intubeaze©) to the glottis can facilitate intubation, inducing laryngeal relaxation and reducing the likelihood of laryngospasm. The author routinely intubates rabbits by direct visualization of the glottis with an otoscope and using a urinary catheter as an introducer (the technique will be discussed during the webinar). Three attempts, and pre-oxygenation before and during each of these attempts, are generally made before giving up and resorting to mask induction. This reduces the risks of tracheal trauma, cyanosis and death. Supra-glottic airway devices (V-gel, Docs Innovent) are now available, relatively easy to place and useful in maintaining an airway. Capnography should be used to confirm correct placement and maintenance of adequate positioning.

Monitoring

Patient monitoring during an anaesthetic procedure is essential. An assistant must be available to constantly monitor adequate anaesthesia level, response to painful stimuli, and vital parameters. The availability of more advanced equipment such as oesophageal sthetoscope, Doppler monitor, electrocardiogram (ECG), capnograph, pulse oximeter, mechanical ventilator and blood gas analysis greatly enhances the chances of a positive outcome. The principles of anaesthesia monitoring are not different compared to those used in dogs and cats.

Reflexes, mucous membranes colour, peripheral pulses, heart and respiratory rate, blood pressure, and body temperature should be monitored at constant intervals. End-tidal carbon dioxide (ET CO2) can be monitored using a capnograph which gives useful information about the patient's ventilatory status. Pulse oximeters can be used to monitor the haemoglobin oxygen saturation levels (SPO2) which correlates well with arterial oxygen levels (PaO2) but does not provide information on blood flow or tissue oxygenation. Arterial blood gas analysis can further improve patient's monitoring allowing evaluation of acid-base status, electrolytes, ventilation and oxygenation if performed at 30 minutes intervals.

All anaesthetics affect thermoregulation and measures should be taken to avoid hypothermia. Rabbits are particularly sensitive to heat loss because of their small body mass and their high body surfaceto-volume ratios. Hypothermia can have serious consequences and it is one of the most common causes of mortality during anaesthesia in small mammals along with respiratory compromise.

Recovery

Monitoring should be continued in the immediate post-operative period as, according to one study, the majority of deaths (>60%) of small mammal patients were recorded in the first three hours following an anaesthetic. During this high risk period, a warm, stress and predator free environment should be provided for the animal's recovery. Respiratory support and oxygen should be provided because respiratory compromise can still occur and it is one of the most common causes for postanaesthetic related deaths.

Mucous membranes colour, pulse and respiratory rate should be monitored till the patient is able to move around. Heat should be provided till the animal is able to maintain its body temperature. Incubators may be used. Baseline parameters should be checked every 5 (in the immediate post-anaesthetic period) to 15 minutes (as recovery progresses). Fluid therapy should be continued and appropriate supportive care instituted including provision of adequate analgesia, assisted feeding and medication to prevent the risk of anaesthetic related gastro-intestinal disorders. Once the animal is alert and moving around, handling and monitoring may be reduced to avoid unnecessary stress. Overnight stay in the hospital may be required.

In these cases, close monitoring of food and water intake, urinary and faecal output is of vital importance.

Complications

In any procedure involving an anaesthetic it is always important to be prepared and have all the equipment needed laid out and ready. It is safe to have charts for emergency drugs doses readily available to be used, avoiding any waste of precious time in case of an emergency. Respiratory and cardiovascular complications can occur but can also be prevented. Securing the airways can surely help in a crash situation but the availability of a capnograph and a mechanical ventilator can greatly enhance the chances of a positive outcome in cases of respiratory compromise.

Alternatively, an Ambu bag can be used to deliver room air if oxygen is not available. When cardiovascular complications occur, an already placed intravenous access is mandatory to deliver fluids (including colloids if required), reversal agents and/or emergency drugs. In these cases, a Doppler and regular blood pressure measurements allow earlier detection of a dropping heart rate and/or blood pressure which permit earlier intervention.