A summary of rabbit anaesthesia – part I: preparation and pre-operative nursing

Tawny E. Kershaw BSc(Hons) APVN(Small Mammal) RVN AFHEA

Tawny graduated from Nottingham Trent University in July 2016 with a FdSc degree in Veterinary Nursing Science. Tawny has since completed her BSc Top-Up degree with Nottingham Trent University with a first class honours and is currently working towards completing the Girling and Fraser Advanced Programme for Veterinary Nursing of Exotics, Wildlife and Zoo Animals. Tawny works as a locum RVN for TEK Locums Ltd covering the Derbyshire, Nottinghamshire, Yorkshire and Manchester areas. Her key areas of interest are in exotic veterinary nursing, orthopaedics and evidence based nursing practice.
Email: tawny.kershaw@hotmail.com

Tawny E. Kershaw BSc(Hons) APVN(Small Mammal) RVN AFHEA

TEK Locums Ltd., Derbyshire, UK

ABSTRACT: As rabbits are the third most common pet in the UK, it is imperative that RVNs are able to provide exemplary care to these patients. It is important that rabbits be treated according to their physiological needs, in order to minimise stress and improve survival rates in the peri-anaesthetic period. This article provides a summary of nursing care and interventions to consider when anaesthetising a healthy rabbit.

Keywords: rabbit; anaesthesia; monitoring; techniques; peri-operative; care

Introduction

The Veterinary Nursing Code of Professional Conduct (VNCoPD) outlined by the Royal College of Veterinary Surgeons (RCVS) details that Registered Veterinary Nurses (RVNs) should endeavour to continually enhance their knowledge and skills in the relevant areas of practice (RCVS, 2020). As rabbits are the third most popular pet in the UK, an RVN's ability to provide suitable care to these patients has become increasingly important (Sibbald, 2018). Brodbelt, et al. (2008) found the post-operative mortality rate of healthy rabbits to be 1 in 137 (0.73%) compared to 1 in 1849 (95%) in healthy dogs and 1 in 895 (0.11%) in healthy cats. This dramatic difference in mortality rates could be attributed to lack of knowledge of rabbit anaesthesia coupled with the rabbit's infamous ability to mask clinical signs of disease (Prebble, 2012). This article will provide the RVN with an understanding of rabbit anaesthesia principles, helping them to react appropriately during the more challenging lagomorph anaesthetics.

Pre-anaesthetic assessment and preparation

Examination and hospitalisation

Pre-anaesthetic examination is a vital part of any anaesthetic plan as it allows the veterinary team (VT) to identify and address any concurrent disease processes and anticipate potential problems that may arise as a result of anaesthetising the individual (Sibbald, 2018). Many rabbits are considered to have underlying disease processes (such as *Pasturella multocida*) and pre-operative examination allows identification of such diseases and classification as per the American Society of Anesthesiologists (ASA) Scale (see Table 1) (Sibbald, 2018). The rabbit's pre-anaesthetic parameters should be noted including heart rate, respiratory rate, weight and if possible, temperature; this allows the VT to recognise significant deviation from baseline parameters during anaesthesia and post-surgery, enabling early detection of complications (King, 2008). The normal parameter ranges for rabbits can be found in Figure 1.

When housing a rabbit patient within the hospital, they should be kept away from predatory species such as dogs, cats and ferrets in order to minimise stress responses (Shington and Cottingham, 2012; McBride, 2017; Speight, 2018). If no separate ward is available, housing these patients as far away from other species as possible and using a blanket to partially cover their cage is also acceptable (Speight, 2018). Stress reduction is a vital part of rabbit hospitalisation as stress-induced

This article has been republished with minor changes. These changes do not impact the academic content of the article.

DOI: 10.1080/17415349.2020.1806766

catecholamine release may predispose the patient to anaesthetic complications including immunosuppression and nosocomial infections (Foote, 2018).

If possible, the owner should provide the patient's usual food to encourage normal eating behaviour whilst in the practice (Speight, 2018). Food should not be withheld prior to anaesthesia as this may slow gut motility, predisposing them to gastric stasis (Sibbald, 2018). Due to their strong cardiac sphincter, rabbits are virtually unable to vomit, and so intra-operative regurgitation is much less likely to occur (Girling, 2013).

Some rabbits may be pair bonded and in this instance, both rabbits should be brought into the practice whenever possible to provide companionship and familiarity (Shington and Cottingham, 2012; McBride, 2017; Speight, 2018). However, if only one of the rabbits is to undergo anaesthesia it is paramount that the correct rabbit is identified upon admission to the practice and, if the rabbits are markedly similar, the rabbit undergoing anaesthesia should have their ears clipped for intravenous (IV) catheterisation with the owner present to ensure no cases of mistaken identity.

Pre-anaesthetic preparations

As in canine and feline anaesthesia, pre-anaesthetic blood work should be considered for older patients and those with suspected underlying disease processes (Srivastava & Kumar, 2011; Paepe, et al. 2013). Analysis of blood samples obtained from otherwise healthy patients is controversial due to the lack of additional information obtained and potential impacts of stress on the patient (Srivastava & Kumar, 2011). In conscious rabbits, the lateral ear vein or saphenous vein are well tolerated for blood sample collection; jugular venepuncture should be avoided as haematoma formation may restrict orbital blood drainage resulting in severe orbital oedema and potential permanent damage (Girling, 2013).

Hair covering the patient's lateral ear vein (Figure 2) should be clipped in preparation for IV catheterisation and a local anaesthetic applied; EMLA™ cream (AstraZenica) is most commonly used and should be applied 40 minutes prior to any catheterisation attempts, then covered with a non-absorbant occlusive dressing (Harcourt-Brown, 2020).

The finger of an examination glove or cohesive bandage with a piece of plastic covering the cream is usually sufficient in aiding absorption without causing the patient any distress (Harcourt-Brown, 2020). In

Table 1. ASA Physical Status Classification (American Society for Anaesthesiologists, 2014; Sibbald, 2018).

ASA Physical Status Classification	Definition of Classification	Example
ASA I	A normal healthy patient	A young patient presented for an elective procedure
ASA II	A patient with mild systemic disease	A patient with a low grade heart murmur and no clinical signs of cardiac disease
ASA III	A patient with severe systemic disease	A patient with chronic dental disease
ASA IV	A patient with severe systemic disease that is a constant threat to life	A patient with ileus
ASA V	A moribund patient who is not expected to survive without the operation	A collapsed patient with a liver lobe torsion
ASA VI	A declared brain-dead patient whose organs are being removed for donor purposes	Not usually applicable in veterinary patients
E	Denotes that the procedure is an emergency. (An emergency is defined as existing when delay in treatment of the patient would lead to a significant increase in the threat to life or body part).	

Biological Parameter	Domestic Rabbit
Weight (kilograms/kg)	1.5kg to 10kg (species dependent)
Rectal temperature (°c)	38.5-40
Respiratory rate (breaths per minute)	30-60
Heart rate (beats per minute)	130-325 (species dependent)

Figure 1. Biological parameters for the domestic rabbit, adapted from Girling (2013).

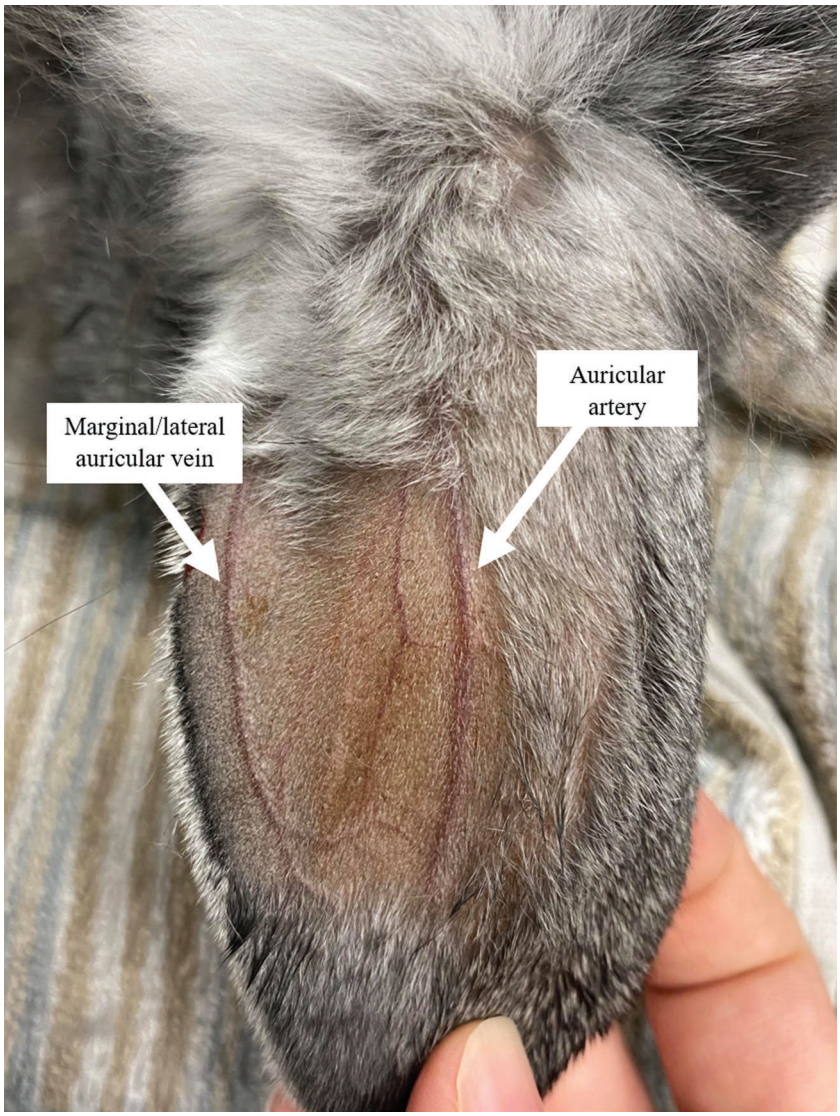

Figure 2. The auricular vasculature.

Table 2. A non-exhaustive list of commonly used drugs in rabbit anaesthesia (BSAVA, 2020; Nield and Govendir, 2019).

Drug Name	Clinical Usage	Dose Range	Considerations	Potential Side Effects/Disadvantages
Acepromazine	Sedation	0.1-1.0mg/kg IM or SC	Healthy animals rarely develop hypotension, hepatically metabolised, light sensitive	Hypotension, poor sedation when used alone
Buprenorphine	Analgesic	0.03-0.06mg/kg SC, IM or IV q6-12hrs	Mean Alveolar Concentation (MAC) sparing, >15 mins onset of action, hepatically metabolised	As a partial mu agonist, it is not recommended to be used in premedication protocols where use of a full mu agonist is anticipated
Butorphanol	Sedation	0.1-0.5mg/kg SC q4hrs	Light sensitive, antitussive, hepatically metabolised	No significant analgesic properties, not recommended to be used where use of a full mu agonist is anticipated
Ketamine	Dissociative anaesthetic	15-30mg/kg IM, SC Or 5mg/kg IV when combined with an alpha-2 agonist Or as a CRI of 10mcg/kg/min preceded by a bolus of 250-500mcg/kg	Provides some analgesia but duration of action is relatively short, IM injection is often painful, when used in combination with an alpha-2 agonist reversal with the alpha-2 agonist should be delayed until approximately 45 minutes after ketamine administration	May cause cardiovascular depression, high doses may result in tachycardia or respiratory depression, prolonged usage may result in drug accumulation and prolong recovery
Medetomidine	Sedation	0.05-0.1mg/kg IV or 0.1-0.3mg/kg IM or SC in combination with an opioid or alpha-2 agonist	Excellent MAC sparing agent, reversible with atipamezole	Causes initial vasoconstriction resulting in a reflex hypotension and bradycardia, avoid in geriatric patients, causes a transient increase in blood glucose
Meloxicam	Non-steroidal anti-inflammatory drug (NSAID)	0.3-0.6mg/kg SC or PO q12-24hrs	Renally metabolised so use with caution in the perioperative period due to the risk of reduced intraoperative renal perfusion. A recent study has shown that use of 1mg/kg oral dosing may be more appropriate at providing adequate analgesia.	GI signs may still be seen and so this should be carefully monitored and
Methadone	Analgesic	0.3-0.7mg/kg slow IV or IM q3-4hrs	Hepatically metabolised, continued usage may result in slowed gastric motility	Respiratory depression can be profound when administered under general anaesthesia
Metoclopramide	Gastric motilant	0.5-1mg/kg SC or PO q6-12hrs	Do not use in suspected gastric obstructions, injectable solution is light sensitive	Very rarely, allergic reactions may occur
Midazolam	Sedation	0.2-2mg//kg IV or IM	Can be combined with butorphanol for sedation to facilitate non-painful procedures e.g. radiography	In humans, respiratory depression and hypotension have been noted, erythromycin inhibits metabolism of midazolam
Ranitidine	Gastric motilant	4-6mg/kg SC or PO q8-24hrs	Administer slowly if using IV route as cardiac arrhythmias have been noted	Stagger doses by 2 hours if using concurrently with metoclopramide as absorption may be slowed

the interest of VT communication, the author labels the occlusive dressing and the patient's hospital sheet with the time the EMLA was applied to avoid early catheterisation attempts causing additional stress. It should be noted that the larger blood vessel running centrally over the pinna (see Figure 2) is the auricular artery and so IV catheterisation **should not** be attempted here due to risk of thrombosis formation and ear tip necrosis (Girling, 2013). The marginal ear vein is preferable in rabbits of medium and large size. The cephalic vein may also be used for IV catheter placement although it is usually less tolerated in conscious rabbits (Girling, 2013).

Pre-medication and induction

In some patients, pre-medication may be required prior to IV catheterisation in order to facilitate stress-free handling. The administration of gut motility stimulants at the time of pre-medication may help to mitigate some of the effects of anaesthesia and stress on the gastrointestinal system although their use in cases of obstruction is contraindicated (Sibbald, 2018). There are a variety of factors that may influence the pre-medicant drugs prescribed by the veterinary surgeon including the patient's cardiovascular status, age, body condition score and the procedure to be carried out. Many of the drugs used in the anaesthesia of rabbits are used "off-licence" and should be done so with informed client consent (Girling, 2013). Table 2 provides a non-exhaustive list of drugs that may be of use in a rabbit anaesthesia protocol and their side effects.

In the interest of providing multimodal analgesia and smooth anaesthesia, the use of a full mu opioid combined with a sedative, adjunctive NSAID and gastric motility drugs is recommended (Girling, 2013; Sibbald, 2018). The sole use of inhalational agents (such as Isoflurane) to induce anaesthesia, is not acceptable practice as it provides no analgesic effect and is irritant to the airways resulting in apnoea and increased risk of mortality (Girling, 2013, Sibbald, 2018). To reduce the patient's risk of hypoxia, oxygen therapy should be provided prior to induction whether by mask, flow-by or oxygen chamber (Sibbald, 2018). It is the author's preference to pre-medicate the patient and place them in an oxygen chamber as this requires minimal handling yet allows for easy observation.

Once anaesthesia has been induced, either by dissociative anaesthetic agents (ketamine) or IV induction agents (propofol or alfaxalone) the patient's airway should be secured via intubation (Sibbald, 2018). Intubation can be achieved with either an uncuffed endotracheal tube or a supraglottic airway device (V-Gel®, Docsinnovent) and the placement checked with capnography (Sibbald, 2018). If maintenance of anaesthesia is to be maintained via face mask, environmental contamination of

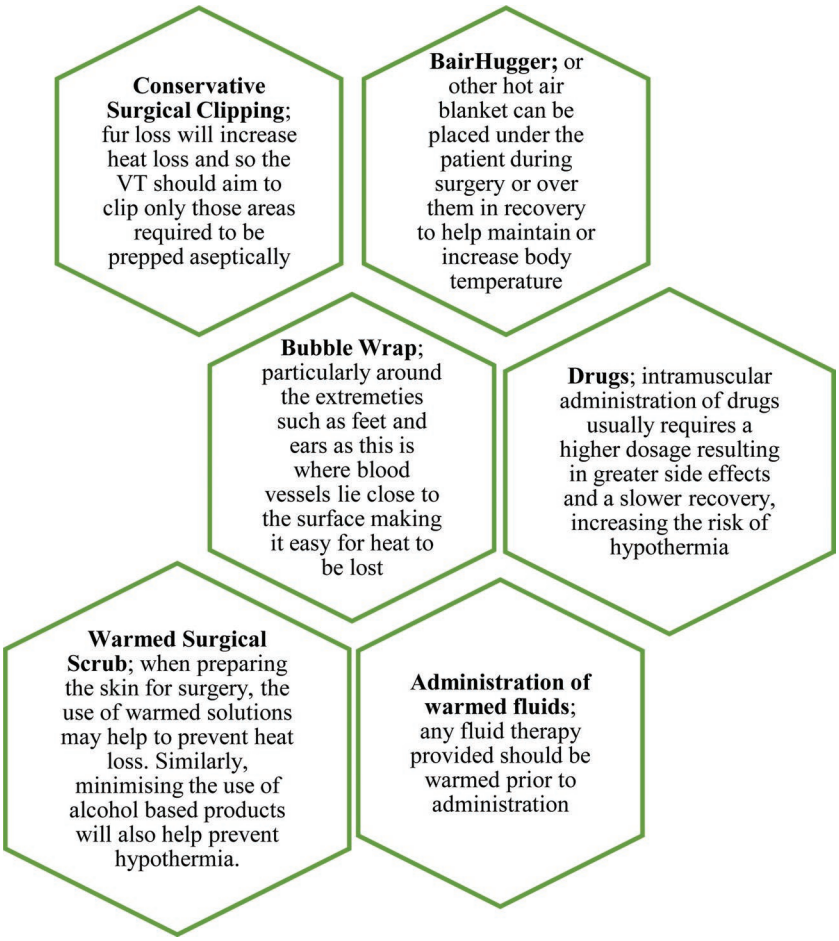

Figure 3. Reducing Hypothermia in the Anaesthetised Rabbit Patient (Druce, 2015).

inhalational agents should be considered, and the appropriate health and safety measures observed. Similarly, it must be remembered that rabbits are obligate nasal breathers and so a face mask of appropriate size should be utilised to reduce dead space and prevent rebreathing (Girling, 2013; Sibbald, 2018).

Fluid therapy and surgical preparation

Fluid therapy is important in rabbits, even for routine surgery as their large surface area to volume ratio means that they will dehydrate much quicker than a larger animal (Girling, 2013). The maintenance fluid rate for rabbits is also described to be significantly higher than in dogs and cats; 75-100ml/kg/24h (King, 2008). Fluid therapy can be given continuously via syringe driver or as bolus doses. Girling (2013) describes the subcutaneous administration of 30-60ml split into two or more sites at any one time, depending on the patient size and tolerance. Bolus dosing of subcutaneous or IV fluids should be considered for those patients likely to chew through a giving set line although, care should be taken with large IV boluses (Girling, 2013; Sibbald, 2018). Any fluids administered should be warmed prior to administration to prevent exacerbation of heat loss. Due to their large surface area to volume ratio, rabbits lose heat much more quickly than larger animals and this may contribute to their higher anaesthetic risk (Druce, 2015). Figure 3 summarises ways in which the team can minimise patient heat loss and prevent hypothermia.

Summary

Rabbits have a significantly higher anaesthetic death rate than dogs and cats (Brodbelt, et al. 2008). As prey species, they are excellently adapted to hide signs of illness and are very easily stressed in the veterinary environment (Brodbelt, et al. 2008; Girling, 2013; Speight, 2018). Preparation for any procedure or anaesthetic event can help to lower mortality rates in all species (Brodbelt, et al. 2008). The second part of this article will focus on intra- and post-operative care of rabbits undergoing general anaesthesia.

References

American Society of Anesthesiologists (2019). [ASA Physical Status Classification System] Available at: http://www.asahq.org/quality-and-practice-management/standards-guidelines-and-related-resources/asa-physical-status-classification-system [05/05/2020 11:45]

Brodbelt, D. C., Blissitt, K. J., Hammond, R. A., Neath, P. J., Young, L. E., Pfeiffer, D. U., & Wood, J. L. N. (2008). The risk of death: The confidential enquiry into perioperative small animal fatalities. *Veterinary Anaesthesia and Analgesia*, *35*(5), 365–373. https://doi.org/10.1111/j.1467-2995.2008.00397.x

Druce, K. (2015). Hypothermia in Anaesthetised Rabbits. *Veterinary Nursing Journal*, *30*(10), 284–286. https://doi.org/10.1080/17415349.2015.1072072

Foote, A. R. (2018). A review of current literature regarding the factors affecting recovery rates after routine surgery in rabbits – part 1. *Veterinary Nursing Journal*, *33*(10), 287–290. https://doi.org/10.1080/17415349.2018.1499452

Girling, S. (2013). *Veterinary nursing of exotic pets*. (2nd ed.). Wiley-Blackwell.

Harcourt-Brown, F. (2020). *Applying EMLA Cream* [online]. Available at: https://www.harcourt-brown.co.uk/media/procedures/applying-emla-cream/view

King, C. (2008). Preoperative nursing care of the rabbit patient. *Veterinary Nursing Journal*, *23*(12), pp, 27–29. https://doi.org/10.1080/17415349.2008.11013754

Paepe, D., Verjans, G., Duchateau, L., Piron, K., Ghys, L., & Daminet, S. (2013). Routine Health Screening: Findings in apparently healthy middle-aged and old cats. *Journal of Feline Medicine and Surgery*, *15*(1), 8–19. https://doi.org/10.1177/1098612X12464628

Prebble, J. (2012). Gastrointestinal stasis and obstructive ileus in the rabbit. *The Veterinary Nurse*, *3*(6), 366–372. https://doi.org/10.12968/vetn.2012.3.6.366

Nield, K., and Govendir, M.. (2019). Comparison of 0.2mg/kg vs 1.0mg/kg of oral meloxicam for safe and effective analgesia in domestic rabbits. *Veterinary Evidence*, *4*(2). https://doi.org/10.18849/VE.V4I2.215

Royal College of Veterinary Surgeons. (2020). *Code of Professional Conduct for Veterinary Nurses* [online]. London, Royal College of Veterinary Surgeons. Available at: https://www.rcvs.org.uk/setting-standards/advice-and-guidance/code-of-professional-conduct-for-veterinary-nurses/ [05/05/2020 11:43]

Shington, B., & Cottingham, S. (2012). Management and care of exotic species. In Aspinall V. (Eds). *The Complete Textbook of Veterinary Nursing* (2nd ed., pp. 603–658). Saunders Elsevier.

Sibbald, R. (2018). Principles of rabbit anaesthesia for veterinary nurses. *The Veterinary Nurse*, *9*(4), 202–206. https://doi.org/10.12968/vetn.2018.9.4.202

Srivastava, U., & Kumar, A. (2011). Role of routine laboratory investigations in preoperative evaluation. *Journal of Anaesthesiology Clinical Pharmacology*, 27(2), 174–110.4103/0970-9185.81824. https://doi.org/10.4103/0970-9185.81824