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# A summary of rabbit anaesthesia – part II: intra-operative nursing and the recovery period

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**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; post-operative; care

## Introduction

This article continues a two part series on rabbit anaesthesia and focuses on intra-operative and post-operative nursing care.

## Intra-operative considerations

When positioning a rabbit for surgery, it is important to remember the large relative size of the abdominal contents compared to the thoracic cavity (Sibbald, 2018). In order to prevent the abdominal organs exerting excessive pressure on the diaphragm and reducing the patient's tidal volume, the patient should be positioned in either sternal or dorsal recumbency (dependent on procedure) with their thorax and head elevated (Sibbald, 2018). As mentioned in Part 1, many rabbits may have subclinical respiratory disease and so this should be considered when positioning them as lateral recumbency may increase the risk of atelectasis in patients with concurrent respiratory disease (Duggan and Kavanagh, 2007, Sibbald, 2018).

## Maintenance of anaesthesia

Anaesthetic maintenance is commonly maintained via inhalational agents such as Isoflurane or Sevoflurane, depending on the team's familiarity with the product. It should

be noted that both inhalational agents have dose dependent cardiorespiratory depressive effects meaning that the use of premedication will dramatically reduce the Mean Alveolar Concentration (MAC) and therefore reduce any potential cardiorespiratory depression. The administration of cold, dry gas along with the inhalational agent will reduce ocular secretions and result in a drying of the surface of the eye, increasing the likelihood of corneal ulceration (Mosing, 2016). Therefore, it is important to provide supplemental lubrication to the eyes throughout the anaesthetic (Mosing, 2016).

## Monitoring techniques

Whilst rabbit anaesthesia differs from that of a dog or cat in many ways, the same monitoring techniques should be employed in order to establish a complete picture of anaesthetic depth; this includes capnography, electrocardiography (ECG), pulse oximetry, blood pressure monitoring and heart and respiratory rate assessments (Sibbald, 2018). As with cats and dogs, peripheral pulses should be synchronous with the rabbit's heart rate and any deviation from this likely indicates cardiovascular compromise that warrants intervention (Sibbald, 2018).

When assessing anaesthetic depth, it is important to remember there are some

significant differences between rabbit reflexes and those of a cat or dog. The most commonly evaluated reflexes are seen in Table 1.

Monitoring of the heart rate can be done using a stethoscope or, in larger patients, an oesophageal stethoscope (Girling, 2013). A pulse oximetry probe can be used on any non-pigmented skin (e.g. ear pinna) and 100% Sp<sub>o</sub><sub>2</sub> saturation should be the aim, as with cats and dogs. Saturation below 93% may indicate hypoxaemia and so investigations into the cause of this low reading must be initiated whilst oxygen supplementation is provided (Girling, 2013). A plethysmograph waveform shape similar to that in Figure 1 indicates good probe contact and so oxygen saturation statistics can be relied upon with more confidence (Page, 2017). Studies have shown that there is little correlation between Sp<sub>o</sub><sub>2</sub> and arterial oxygen saturation (Sa<sub>o</sub><sub>2</sub>) so wherever possible this should not be the sole indicator of tissue perfusion (Eatwell et al., 2013). Similarly, many pulse oximeters will not read heart rates exceeding ~250 beats per minute and so this should be considered during their use (Girling, 2013).

Capnography is a favourite monitoring device for many anaesthetists as it provides valuable ‘real-time’ information

about the patient’s ventilation status (Schauvliege, 2016). In order to reduce dead space, side stream capnography is recommended for use in rabbits although these can only be used in intubated patients (Girling, 2013). Capnography and blood gas analysis have been shown to positively correlate in anaesthetised rabbits, meaning that capnography should be utilised to assess ventilation efficacy in the absence of blood gas analysis (Eatwell et al., 2013). Girling (2013) and Lafferty and Pollock (2018) describe end tidal capnography values between 35-45mmHg to be considered normal and as in other mammals, to ensure that inspired carbon dioxide (FiCO<sub>2</sub>) remains at 0 mmHg to prevent rebreathing causing metabolic acidosis. ECGs can be interpreted in the same way as in dogs and cats due to the anatomical similarities between their cardiac tissues although atraumatic attachments should be used (Girling, 2013). Doppler probes can be used to monitor heart rate and blood pressure whilst under anaesthetic, the audible signal allows the whole veterinary team (VT) to detect any changes in heart rate or rhythm (Girling, 2013). Whilst the use of a Doppler probe to measure blood pressure may be more reliable in smaller patients, it only provides information on systolic pressure (Girling, 2013). Normal blood pressure

measurements for a rabbit can be seen in Figure 2.

### The recovery period

A warm, quiet recovery area will help to aid a smooth recovery from anaesthesia (Girling, 2013). Patient’s with surgical wounds should not be housed on wood shavings or other bedding that is able to become stuck to the wound. Hypothermia can greatly contribute to perioperative mortality rates, prolong recovery times, and increase nosocomial infection risk so every effort should be made to maintain the patient’s body temperature around 39°C perioperatively (Brodbeil et al, 2008; Girling, 2013; Druce, 2015). Hyperthermia can also be fatal due to the rabbit’s significant lack of sweat glands and so monitoring of body temperature whilst using active warming methods is vital (Girling, 2013; Druce, 2015). Heat mats and hot water bottles can be very effective in increasing patient temperature but should never be applied directly to the patient’s skin due to the risk of burns (Druce, 2015).

Continued monitoring of the patient until they are fully conscious is recommended to detect any early changes or deterioration; this should include documented readings of the patient’s heart rate, respiratory rate and temperature taken at five minute intervals (King, 2009). Pain scoring should be carried out to ensure adequate analgesia. Whilst pain scoring may prove difficult in prey species due to their ability to mask clinical signs of pain, Keating et al. (2012) have developed The Grimace Scale in order to help evaluate and quantify pain (see Figure 3).

If the rabbit has not begun to eat again 4-6 hours postoperatively, supplemental nutritional support is recommended to prevent ileus and hepatic lipidosis (King, 2009; Prebble, 2012). Anorexia can be due to stress or pain and so efforts should be made to reduce these and encourage the patient to eat (Sibbald, 2018). Naso-oesophageal feeding tubes can be used in patients that are difficult to syringe feed although the details of placement and

Table 1. How to assess and interpret reflexes under anaesthetic (Girling, 2013; Sibbald, 2018).

Reflex	How to Assess and Interpret
Righting reflex	This is usually the first reflex to be lost and renders the animal unable to return itself to sternal recumbency
Palpebral reflex	In rabbits, this reflex can be retained even in deeper planes of anaesthesia and so should not be solely relied upon to assess surgical depth of anaesthesia
Deglutition (swallow) reflex	Whilst difficult to assess, this is often lost early on
Corneal reflex	The absence of this reflex, as in dogs and cats, indicates central nervous system depression and a dangerously deep plane of anaesthetic
Jaw tone	Difficult to assess in rabbits due to their small oral cavity
Ear pinch	This reflex is a relatively good indicator of surgical plane of anaesthesia; pinching the ear pinna would typically result in the rabbit shaking its head but this reflex should be absent at a surgical plane of anaesthesia
Pedal reflex	Whilst loss of this reflex does indicate a surgical plane of anaesthesia, rabbits often do not lose this reflex until very deep planes of anaesthesia have been achieved (often dangerously deep levels)
Eye position	As many anaesthetic protocols for rabbits include ketamine, it should be remembered that ketamine causes centralisation of the eye, rendering eye position an unreliable method for anaesthetic depth assessment

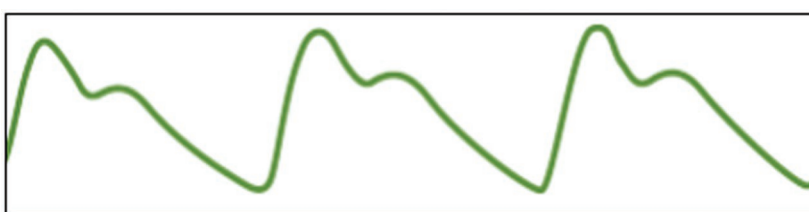


Figure 1. A normal plethysmograph wave.

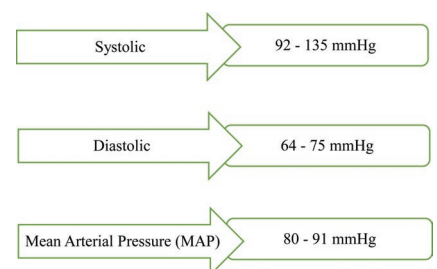
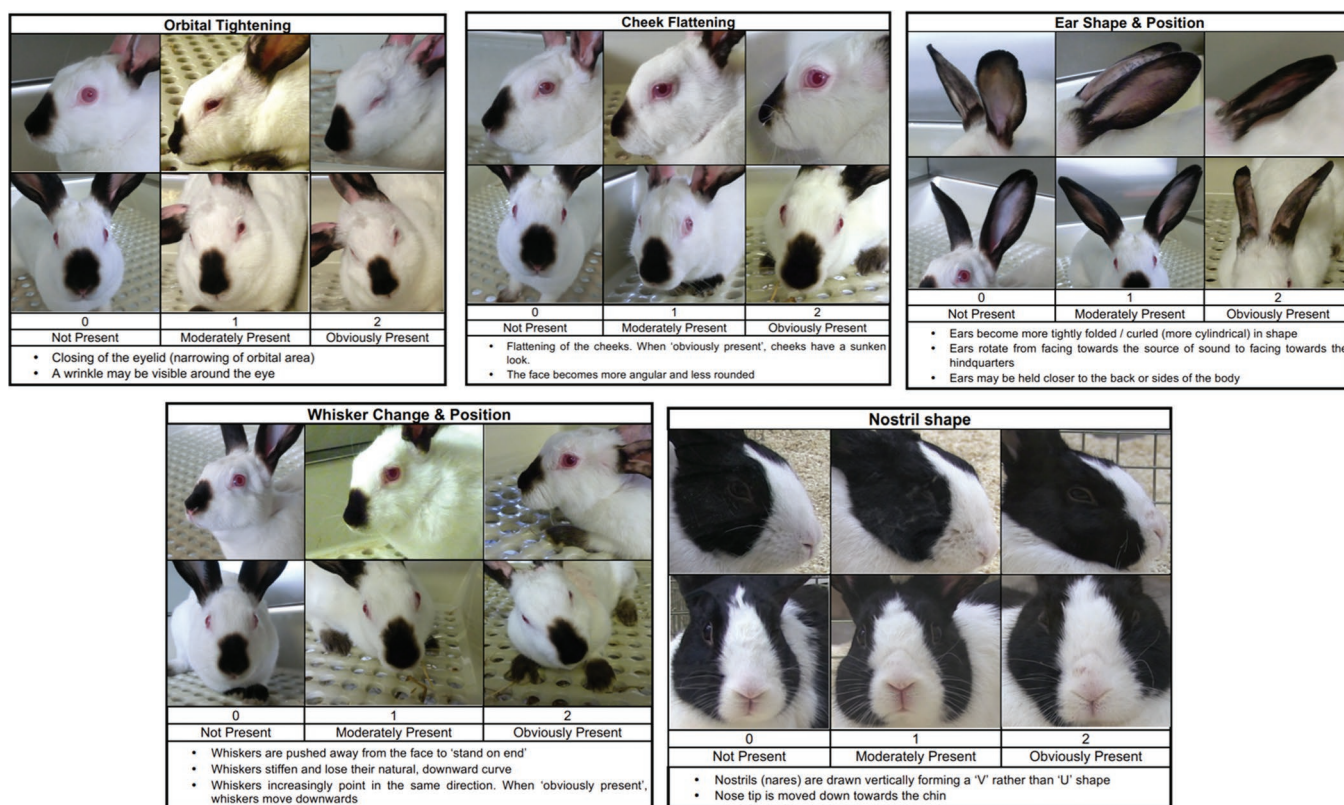


Figure 2. Normal rabbit blood pressure parameters (Jepson, 2016).



■ Figure 3. Rabbit Grimace Scale (Keating et al., 2012).

management of these tubes is outside the scope of this article (King, 2009). When using supplemental nutritional support, it is important to ensure the patient is receiving enough calories and so the manufacturer's guidelines should be followed when constituting the food. Rabbits get much of their water intake from fresh vegetables and so their hydration levels can rapidly deteriorate when they become inappetent; this should be addressed by the continuation of fluid therapy until they are eating independently (Girling, 2013).

Many veterinary surgeons prefer the patient to have eaten and passed faeces before being discharged from the surgery to ensure adequate gastric motility. Upon discharge, the importance of monitoring faecal output should be stressed to the owner and adequate analgesia prescribed (King, 2009; Girling, 2013). Elizabethan collars are not routinely used to prevent wound interference as they prevent the rabbit expressing normal behaviour such as caecotrophy (King, 2009; Girling, 2013).

## Conclusion

Statistically, rabbits are at higher risk of anaesthetic mortality and morbidity than

dogs or cats (Brodbeck, et al. 2008). Nurses play a vital role in the perioperative care of rabbits and should take reasonable steps to mitigate peri-anaesthetic complications. Ensuring the nurse caring for the patient understands the significant physiological differences between a rabbit and more commonly seen species can help to reduce mortality rates.

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