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A review of current literature regarding the factors affecting recovery rates after routine surgery in rabbits – part 1

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ABSTRACT: Veterinary professionals must maintain a high level of knowledge about all patients. Rabbit ownership is dramatically increasing and continues to do so, so it is essential to continue research and review current literature. Registered Veterinary Nurses (RVN) and Veterinary Surgeons (VS) must understand the factors that contribute to anaesthetic recovery in rabbits, as emergencies and fatalities during the recovery stage are higher in comparison to cats and dogs. Improvements in care for rabbits has increased life expectancy and owners expect the same level of care for all patients; therefore, research must continue as rabbit surgery is increasingly common.

Keywords: Literature review; rabbit; peri-operative care; mortality rates

Rationale

Royal College of Veterinary Surgeons (RCVS) regulations state that veterinary professionals must maintain a high level of knowledge about all patients, as exotic pet ownership is dramatically increasing and continues to do so. Therefore, it is essential that the RVN and the VS continue to research and review current literature (Girling 2003, Ayers 2016). RVNs and VSs must understand the factors that contribute to anaesthetic recovery in rabbits, as emergencies and fatalities during the recovery stage are much higher in comparison to cats and dogs (Brodgelt 2012). Improvements in medical and surgical care for rabbits has increased life expectancy and health and welfare; owners now expect the same level of care for all patients; therefore, improvements in this field must continue, as routine rabbit surgery is increasingly common (Mancinelli 2015b). Research on this topic will improve RVN knowledge about why rabbits have problems during the post-operative period and allow for quality, evidence-based nursing.

Introduction

Rabbits are the third most common pet in the UK; the rabbit population in the UK is an estimated 1.5 million, in comparison to 9.4 million dogs and 11 million cats (PDSA 2016, Mancinelli 2017). Notably, as found in the PDSA PAW Reports, the rabbit population has also been gradually increasing over the years by approximately 200,000 pet rabbits per year (PDSA 2016). Likewise, the standards of care have improved over the last 20 years, as rabbits have continued to present in practice (Mancinelli 2017). However, due to the high rates of mortality that are still apparent in practice, it is essential that the RVN addresses each factor which could influence post-operative recovery. Brodgelt's study (2008) found that 1.39% of rabbits died under the anaesthetic compared to 0.17% of dogs; furthermore, most rabbit fatalities and emergencies occur within three hours post-operation.

To assess why the percentage of rabbit fatalities is so high, the RVN must understand the pathophysiological effects of

anaesthesia in rabbits, alongside evaluating factors for each individual patient (Mancinelli 2017). RVNs remain apprehensive about rabbit anaesthesia and may lack confidence when treating these patients; understandably, as the number of canines and felines treated in practice is much higher (West 2017). The RVN may struggle to be competent in rabbit anaesthesia and recovery if the number of rabbits in practice is so low. The Code of Professional Conduct for Veterinary Nurses (COPC) 3.3 states that RVNs must maintain and develop the knowledge and skills relevant to their professional practice and competence (RCVS 2017a). However, 1.2 of the COPC notes that RVNs must keep within their own area of competence and refer cases responsibly (RCVS 2017b). To abide by such rules and to allow the RVN to feel confident treating rabbits, continual professional development (CPD) should be undertaken on a regular basis. The CPD should be relevant to the work the RVN is undertaking, including suitable training and education on how to understand and respond to any problems which could occur.

Several factors can influence an animal's recovery time, including age, breed, anaesthetic agent, the length of anaesthesia and underlying disease (Crompton and Hill 2011). There are some known factors which can cause post-operative fatalities in rabbits including stress, hypothermia, incorrect handling and inadequate induction. Consequently, the RVN must know why these factors differ to other species and the significance of not assessing the actual and potential problems of routine rabbit anaesthesia.

Rabbits, as a prey species, are very easily stressed via simple disruptions in routine and often disguise signs of pain and stress; remarkably, stress is one of the most widely accepted factors which can cause post-operative complications (Mancinelli 2015b). Emergence delirium can occur during recovery due to stress on induction. This is defined as a dissociated state of consciousness which causes extreme behaviour, confusion and thrashing, which could lead to spinal fractures. The RVN must understand natural behaviour and habits to be able to interpret signs of stress which may have a vast impact on the health and welfare of the patient (Mancinelli 2016). RVNs play a vital role in addressing stress as they often provide environments, handling and monitor pain. Consequently, the RVN must understand the pathophysiological effects of stress to know why implementing

changes to these areas benefits the patient (Wiseman and Benato 2016).

Notably, there is evidence that handling can cause stress and it is now widely accepted that rabbits do become stressed when handled above ground (Bradbury 2016). Rabbits in practice are often incorrectly handled and spinal fractures are still common. Furthermore, handling and stress can cause hyperglycaemia, leading to intestinal obstruction and nerve and kidney damage (Druce 2015).

Stress

As found through research in humans and companion animals, stress is immunosuppressive, making patients prone to hospital-acquired infections which can delay recovery (Harcourt-Brown 2005). Lui et al.'s (1994) study in humans showed the effects of pre-operative stress on post-operative recovery. Stress was measured in 30 patients meeting standards within a set criteria. This study showed the pathological effects of stress on both short- and long-term recovery. Pre- and post-operative stress levels were measured using cognitive tasks. This may be harder to perceive in animals as they cannot answer questions; however, the corresponding physical parameters could be measured in animals. Short-term results indicated strong positive correlations between stress and recovery and lasting effects of stress within the following weeks.

However, 43% of the human subjects used had an anaesthetic before and had a good understanding of the induction procedure; therefore, it is likely they would be less stressed than those without such knowledge. When using this study for comparison with rabbit pre-operative stress, it is worth noting that rabbits are unaware that a procedure is going to occur and are more likely to become stressed by a change in routine and by being in practice.

On that note, the owners' understanding and feelings about the procedure may be reflected upon and impact the rabbit's behaviour. The RVN should explain the procedure with professional integrity and honesty, assessing all the benefits and risks of the procedure with the owner (Flemming 2006). Owners are often aware that the visit can be stressful for their rabbit, but they do appreciate veterinary staff's knowledge and are more likely to undertake pre-operation instructions correctly and aid the RVN in reducing stress if such information is provided and explained appropriately (Mancinelli 2015a).

Rabbits are prey species and are easily stressed when placed in unfamiliar surroundings, such as the veterinary practice. RVNs should aim to reduce stress in all patients by altering environments (Varga 2013). Rabbits should be hospitalised in a quiet area away from predator species. Ideally, species-specific wards should be available to reduce stress in all patients (Ackermann and Aspinall 2016). Rabbits will feel more secure if provided with a hide, bedding and gnawing material. If possible, the patient's companion should be housed too to reduce stress (Mancinelli 2015a).

Catecholamines are a group of amines which control the body's physiological response to stress (Studdert 2012). The release of these hormones in a stressful situation is part of the fight-or-flight response, often increasing cardiac output, elevating blood pressure and glucose concentrations, reducing gut motility and overall increasing oxygen demand (Carrington-Brown, 2016). These hormones can significantly increase the risk of cardiac arrhythmia, especially when combined with anaesthetic agents and the likelihood of hypoxia.

Roatta et al. (2011) studied the effects of stress on conscious rabbits. Nineteen rabbits meeting the standards within the set criteria were exposed to a randomised sequence of acute stressors and haemodynamic responses and basal catecholamine concentrations were recorded. These stressors could be related to procedures in practice and consisted of: pinpricks, air jets, oscillation of cage, inhalation of vapours and intramuscular injection of saline solution. The study met the principles of laboratory animal care and gained approval from the Ethical Committee for Animal Experiments at the University of Turin (Italy) and the data were used in other reports so that multiple studies on the rabbits did not have to be performed. However, the ethics of this study can be questioned, in that exposing rabbits to such procedures is already accepted to be a stressful event.

Significantly, the results showed that all stressors on all subjects increased the arterial blood pressure and vascular conductance in the facial artery, the lowest being the pinprick test (24%) and the highest the box oscillation (55%). Box oscillation is the back-and-forth movement of the cage, which could be compared to the transportation of the rabbit in a carrier (Schadt and Hasser, 1998).

It is the role of the RVN to advise clients on safe transportation to help reduce stress; the client should be advised to

use a safe top-opening carrier which can be strapped into the vehicle facing the direction of travel (RSPCA 2011). If the client is walking to the practice, ensure the journey is short and the carrier is as stable as possible. Furthermore, any companions should travel with the patient to help reduce stress and prevent rejection when they return home (RAW 2016). Roatta et al. (2011) study showed that simple procedures which are performed pre-operation may cause more stress than perceived.

Handling methods

Tonic immobility (TI) is described as a reversible state of profound motor inhibition that can be induced in prey species; it can last from several seconds to several hours (Varga 2013).

Darwin noted TI as the “death feint” or “trance” and believed that it is a terminal defence mechanism to limit injury when unable to escape and to deceive the predator (Darwin 1869, Bradbury and Dickens 2016). TI has been noted as a useful method of restraining rabbits for minor procedures in veterinary practice including nail clipping and teeth burring (Bivin 1994). At the same time, Okermann (1998) suggested TI for use in invasive procedures, such as castration in a variety of prey species. However, it is widely accepted that TI cannot replace anaesthesia and analgesia as it does not meet the triad of anaesthesia and the rabbit may present with secondary hyperaesthesia (Fraser & Girling 2009, Bradbury 2016). The Animal Welfare Act (2006) states that while under the direct care of the VS or RVN, protection from pain, suffering and injury must be provided. The use of TI for anaesthesia and analgesia will breach this law as there is evidence that the rabbit is still conscious (McBride 2006). Furthermore, RCVS Veterinary Nursing Code of Professional Conduct (2017) states that the health and welfare of the patient is the first priority and the VS must provide pain relief (RCVS 2017b, RCVS 2017c).

McBride’s study (2006) showed the physiological and behavioural responses to TI including increased heart rate, respiratory rate, corticosterone levels and elevated blood pressure. Furthermore, most rabbits showed fearful behaviour and expressions including hiding and overgrooming. McBride’s (2006) publication concluded that TI does cause stress and recommended that owners do not perform TI, whereas veterinary professionals may use TI for minor procedures as it has fewer

physiological effects than anaesthesia. McBride reiterated this again in (2011) and was supported by Malley (2007) and Varga (2013), who advised clients to not perform TI unless necessary for minor procedures where anaesthesia would cause more harm. Mancinelli (2014) also agreed, but noted that if signs of stress are shown then it should be stopped immediately.

Fraser and Girling’s (2009) publication argued that TI was no longer advocated as an advisable way to handle rabbits due to the stress response and the physiological effects; this included both clients and veterinary professionals using TI as a method of restraint. Magnus (2009) expressed a similar view and moved away from the idea of TI, starting to assess how clients and veterinary professionals misunderstand rabbit behaviour while assessing how to address common problems with rabbit handling. Rabbits are not as domesticated as canines and felines, although bonding characteristics are exhibited the same. Therefore, it was recommended that more research is performed for TI to be valid for use (Oxley and Ellis 2015).

Bradbury and Dickens’ (2016) literature review about rabbit handling had revolutionised the way veterinary professionals should handle and advertise rabbit health and welfare. In terms of TI, the popularity of internet videos of rabbits under TI may suggest that this process is acceptable. It is the role of the VS and RVN to ensure that owners are educated about the stress that TI can cause and why veterinary professionals will avoid it where possible (Bradbury 2016). Moreover, it is now accepted that lifting rabbits can also cause stress, as the only time in the wild where they would be lifted would be by a predator (Kernot 2016). Veterinary professionals should avoid lifting rabbits by performing clinical examinations in the carrier to set an example to the client. If lifting is unavoidable, then the paws and hind legs should be supported without touching the rabbit’s paws; a towel may be useful to avoid direct contact and stress (Bradbury 2016).

To help reduce stress pre-operatively veterinary professionals should aim to handle rabbits as little as possible. Procedures can be grouped together to reduce the time spent handling the rabbit. Incorrect handling can lead to spinal fractures because rabbit’s bones are fragile and are prone to vertebrae issues. Several publications have noted that this commonly occurs during masked inhalation and suggested that a towel is used to support all the limbs

(Longley 2010, McInnes 2011, Suckow et al. 2012, Varga 2013).

In conclusion, there are several factors identified which can cause post-operative fatalities. Stress and handling of rabbits makes an important contribution to post-operative mortality and recovery rates. It is the RVN’s duty to maintain health and welfare in these patients and the RVN must be able to assess each factor individually and understand the complications of each. The second part of this article will focus on how hypothermia and induction methods can impact post-operative fatalities and mortality rates.

Disclosure statement

No potential conflict of interest was reported by the author.

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