2528-9705

Örgütsel Davranış Araştırmaları Dergisi
Journal Of Organizational Behavior Research
Cilt / Vol.: 7, Sayı / Is.: S, Yıl/Year: 2022, Kod/ID: 22S0-844

Reviewing Animal Pain in Veterinary Surgery

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ABSTRACT

Choosing surgical anesthetics and postoperative analgesics that best control animal suffering is a challenge for scientists performing major survival surgery on laboratory animals because they are aware that both the pain and the medications used to treat it can have an impact on the research's findings. Scientists that publish thorough explanations of veterinary surgical techniques allow for the critical and methodical examination of data, show compliance with standards for animal welfare, and provide direction for other scientists on how to carry out their own field investigations. We investigated what knowledge about animal pain control a conscientious scientist would require to design an effective experiment. Additionally, we covered the topic of animal suffering before, during, and after veterinary procedures in this study.

Keywords: *Pain, pain management, livestock, veterinary surgery, pain relief*

INTRODUCTION

Pain is described as "an unpleasant sensory or emotional experience linked with actual or potential tissue damage" by the International Association for the Study of Pain (IASP). Veterinarians have a moral obligation to lessen animal suffering. Postoperative pain management is not now a standard procedure in all veterinary hospitals and clinics, despite the fact that the majority of veterinarians acknowledge that animals experience pain. Since the patient is non-verbal and the physician must rely on their own observations and reports from the patient advocate, the problem of pain management in animals is quite similar to that in pediatrics in humans. As a result, the issue of inadequate pain treatment in children has long perplexed doctors [1].

Acute pain is a skeletal muscle spasm, and sympathetic nervous system activation connected with a specific disease or injury serves a biological purpose and is self-limiting. The components of the pain transmission route in the peripheral and central nervous systems both exhibit amazing flexibility, enhancing pain signals and supplying sensitivity in the evaluation of chronic damage. Flexibility can be advantageous when it promotes defensive reflexes, but if alterations continue, a chronic pain condition could arise. Acute pain is frequently brought on by trauma, surgery, childbirth, medical procedures, and acute illness situations. It's also crucial to be aware that various body organs and tissues may respond differently to painful stimuli. For instance, parenchymatous organs are less painful than mucous membranes, the cornea, or dental pulp [2].

Vital signs of pain in animals

Vital sign scales cannot differentiate between different types of pain, such as pain from surgery or other types of pain. Additionally, animals with chronic pain may have normal vital signs. These signs are insufficiently precise to distinguish between pain and other stresses like worry, fear, or bodily reactions to specific medical disorders (such as anemia). In other words, even if an animal's heart rate and breathing rate are normal, it might nevertheless be in pain. Especially after surgery or after severe damage, animals' vital indicators of pain, including heart rate, respiration rate, and blood pressure, can be utilized to gauge how they are reacting to acute painful stimuli. In some circumstances, such as those involving horses with colic, the measurement of vital signs can also be used to evaluate pain [2].

Pain and laboratory animals

Every day in laboratories all across the world, researchers operate on animals. They make plans in advance to deal with whatever discomfort these operations can bring on. What knowledge might a dedicated scientist discover about controlling animal suffering during surgical planning for an effective experiment? While surgery may be required for diagnostic purposes, the ensuing discomfort is typically not. The surgical anesthetics and postoperative analgesics that scientists recommend must be deliberately chosen. Since removing the pain produced by animal surgery necessitates the administration of potent anesthetics and analgesics, which have repercussions on the animal's biology beyond pain alleviation, they sometimes opt to leave the animals' suffering untreated. When publishing work involving animal surgery, scientists should include a detailed description of pain management in order to address both the issues surrounding animal surgical pain as well as the scientists' need to reduce undesirable experimental artifacts of strong medications and the pain itself. It is morally required to manage the pain of experimental animals. The fact that surgical anesthetics, potent postoperative pain relievers, and untreated pain all have significant impacts on animal biology presents investigators with a methodological issue as well. Both analgesics and painkillers have the potential to skew experimental findings. The choice of surgical anesthetics, postoperative analgesia, as well as any decision not to treat postoperative pain should all scientists doing major surgery on animals be able to describe [3].

Identifying and preventing pain during animal surgery and after surgery

It's crucial to comprehend how surgery causes pain, in part because many animals undergo typical procedures and consequently experience whatever pain they may cause. Additionally, individuals with veterinary expertise typically carry out surgical operations, making it quite simple to provide them with the essential pain management abilities.

Studies on the pain brought on by surgery can be especially interesting from a scientific perspective because the procedure can both produce and relieve pain [4] (by treating painful conditions).

Despite the widespread use of analgesics in companion animal medicine, new research has demonstrated that farm animals frequently do not get analgesics for uncomfortable procedures or conditions. Younger animals are frequently denied analgesia: Canadian doctors noted analgesia in 0.001% of castrated pigs, 6.9% of castrated beef calves, and 18.7% of castrated dairy calves under the age of 6 months [4].

Surgical pain measurement

Measures of general bodily function, physiological reaction, and behavioral changes are all used to assess pain in animals. Animals' post-operative behavioral reactions may involve actions aimed toward the surgical site (e.g., grooming toward the wound, tail wagging after docking, or ear wagging after detachment). In addition to altering laying behavior, postoperative pain can also have a wider range of effects on the animal's temporal budget, including alterations in movement. Specific behaviors that manifest in the hours following abdominal surgery include arching, arching, standing and arching, rocking, and bending, according to research on rats, cats, and sea lions. There is no overarching framework that can be used to understand these numerous criteria or anticipate which answers are most likely to materialize in certain circumstances. Instead, many studies appear to select various response criteria for various reasons, which are frequently not addressed in the publication [4].

Pain management in small animals

Hyperalgesia, which is the body's enhanced sensitivity to pain, may be brought on by injury to peripheral nerves or pain receptors. Or, to put it another way, hyperalgesia is an increase in the body's sensitivity to stimuli [5].

1. Proper management of pain lowers prevalence and mortality, making it one of the major variables in the care of critically sick patients.
2. Multiple analgesias, or combining several active molecules with various nociceptor pathway methods, offer greater pain management in clinical settings.
3. Because the degree and length of discomfort might differ significantly from one instance to the next, repeated examinations and periods of illness are crucial and essential. Unfortunately, managing pain depends on a number of factors, such as [5]

1. There are significant cultural and geographic differences in how veterinarians assess the level of pain in their patients, and little training is provided to staff members in this area.
2. It can be quite challenging for certain animals to recognize pain and gauge its severity.
3. The specialists' access to conventional therapy resources is insufficient (at least in some countries such as France).

The International Association for the Study of Pain (IASP) has proposed the following definition, which covers all topics related to pain in animals:

Pain is an unpleasant emotional experience that triggers motor and autonomic defensive reflexes. As a result, learning behavior is avoided, and eventually, species-specific behavior, including social behavior, can alter [5].

Reviewing the clinical assessment of animals pain

Pain behavior

According to the pain behavior construct, pain alters behavior in ways that are visible to observers, and the degree of change is correlated with the level of pain. While certain actions may happen frequently, others may happen so seldom that they are useless. Some can only be seen under certain circumstances outside the kennel environment, while others may only be seen in the constrained spaces of a cage or run (for example, the hourly rate of position changes) (e.g., a dog adopting a new posture while begging in a cage). Different techniques may be used to cause these behaviors. They could be the outcome of pathology-related bodily harm. They could act as a shield to stop the development or worsening of pain. Some of these could be the animal's natural ways of expressing discomfort or ways to divert attention, settle down, or summon aid. Others might be a coping mechanism adopted to lessen suffering [7].

Necessity and evaluation of pain methods in animals

Pain is described by the International Association for the Assessment of Pain (IASP) as an unpleasant emotional experience brought on by real or prospective tissue injury. One of the key areas of veterinary research and animal protection is pain evaluation and alleviation. We require adequate knowledge of pain physiology, onset, duration, and therapy response rates in order to properly control pain [8]. We need to be able to gauge the existence and degree of pain in order to effectively manage it and track the success of therapy. It is challenging from an ethical standpoint for veterinarians to prescribe or utilize medicines insufficiently if the pain is not correctly appraised. The use of painkillers excessively can also have negative side effects, such as decreased appetite, which slows the healing process. Pain is assessed using a variety of variables. Comparing the animal's behavior changes before and after inflicting pain is one method, and these changes can be assessed descriptively, subjectively, or statistically, such as twitch, flinch, withe, stretch, scratching, backarch, hop, and ow and high rare. It is also possible to assess pain using physiological reactions of the animal's body to pain, such as accelerated breathing and heart rate as well as hormone secretion. For instance, cortisol release rises in the presence of pain. With the use of medicines, the level of pain is also assessed; the more intense the pain, the higher the dose of painkillers required to reduce the associated symptoms [8].

Pain relief and reasons for not using analgesics in animals

Before administering anesthesia, the pain brought on by the procedure should be calculated. Based on the anticipated severity of the pain, a suitable pharmacological strategy should be taken into account for both intraoperative pain relief and postoperative pain relief. Pain may be prevented more easily than it can be treated, much like many illnesses. The following are some typical justifications for not employing analgesics in veterinary medicine for post-surgical pain relief [9]:

- It can be challenging to identify pain in animals since various species exhibit distinct behavioral signals of discomfort.
- Compared to dogs and cats, farm animals (food animals) are less responsive to pain.
- During general anesthesia, patients do not need prescription painkillers.
- Post-operative discomfort is essential for wound healing and to keep patients from engaging in the excessive activity.
- Painkiller side effects are numerous.
- The price of surgery rises when painkillers are used.

Pre-anesthesia stage, anesthesia induction stage, anesthesia maintenance stage, and post-surgery stage are the four distinct stages that may be used to study pain control during surgery. The usage of medicines at this time is highly crucial since the worst pain after surgery hits between 24 and 72 hours following the procedure. In any case, every patient needs to be assessed individually and given the appropriate amount of pain medication. Depending on the degree of tissue damage following orthopedic surgery, the pain medication should be administered for at least 3-5 days.

Discussion

Practitioners of animal health argue that veterinarians need to focus more on managing pain in animals generally and during surgery. However, overall, they show that the treatment of pain in animals, even in developed nations, is not in a good state [6]. This is according to research that

have been carried out in various countries regarding the viewpoint and status of pain management in animals.

Table 1. Anesthesia protocol in horses [6]

pre-anesthesia	Aspromazine-xylazine Aspromazine Xylazine
induction of anesthesia	Diazepam Ketamine Ketamine Xylazine-diazepam-ketamine xylazine-ketamine thiopental
Maintenance of anesthesia	halothane Isoflurane Xylazine - Ketamine Diazium - Ketamine Ketamine

Multiple protocols may be used by an institution.

Given that ketamine is typically taken after diazepam, it is referred to as an induction medication. The findings of these investigations highlight the need for newer judgments in the field of animal pain control, as well as a need for a more precise assessment of pain symptoms. Unfortunately, there is little information accessible in Iran on how to prevent and cure animal discomfort, particularly after surgery. It appears that the sample chosen for this study can accurately reflect the general situation of pain management following surgery in Iranian veterinary medicine, given that the majority of animal surgeries are carried out in university-based facilities, which also serve as the primary training ground for active veterinarians pursuing clinical doctorates in both general and specialized fields. Four distinct stages can be used to examine pain management following surgery. Pre-anesthesia, induction of anesthesia, maintenance of anesthesia, and post-surgery are among these processes. The species of the animal, age, kind of operation, and the animal's health at the time of referral to surgery are all variables that often impact these four phases. The process leading up to the induction of anesthesia is when pain, especially minor discomfort, is reduced significantly by setting the right conditions to lessen the patient's fear and anxiety. The administration of sedative medications is crucial at this point in order to lessen the animal's fear and anxiety (caused by entering a strange environment and the presence of strangers), and the administration of painkillers is crucial in order to provide analgesia throughout and even after the procedure [6]. The current study did not inquire about the selection of an analgesic protocol according to the type of operation and how unpleasant it is, despite the fact that various surgeries can produce varying degrees of pain. In fact, veterinary surgeons probably don't have a lot of options due to the restricted sorts of medications that are readily available.

Pre-emptive analgesia, as it is called, has been demonstrated in several trials to have superior outcomes than post-operative pain management. In order to lessen the intensity and consequences of pain associated with surgery, analgesics should be included in the pre-anesthesia routine for both small animals and horses. The optimal mix of narcotic and sedative medications is advised for use as a pre-anesthesia treatment for small animals (analgesic

neurolith). Non-steroidal anti-inflammatories are another class of medications that can be used as analgesia prior to anesthesia. In the pre-anesthesia of the horse, the use of opiates, non-steroidal anti-inflammatory drugs, and alpha 2 agonists (xylazine, detomidine, and ramifidine) can play a role in delivering analgesia during and after the procedure [6].

Non-steroidal anti-inflammatories were found to be the most often utilized medications in this study for horses and small animals (mainly ketoprofen and fluoxetine). Although it is accessible as a veterinary analgesic, Dipiron (metamizole) is also a member of this medication class but has garnered less attention. Prednisolone and dexamethasone were cited as possible painkillers in two cases, although it should be highlighted that while corticosteroids have an anti-inflammatory effect, they should not be used as painkillers following surgery [6].

Non-steroidal anti-inflammatories, particularly flutaxine and phenylbutazone, were the most commonly prescribed medications for horses following surgery. Additionally, phenylbutazone is typically used for muscular aches, whereas flutaxine is typically utilized for visceral problems like colic. Unfortunately, postoperative pain management in ruminants is largely ignored, as seen by the study's findings [6].

Non-steroidal anti-inflammatory medicines (NSAIDs) work to reduce inflammation and pain by blocking the cyclo-oxygenase enzyme and lowering prostaglandin synthesis. These medicines have also been used to treat post-operative pain. These medications might cause renal problems, blood coagulation issues, and stomach ulcers as adverse effects. These medications are now crucial in managing postoperative pain. According to the current study, only a tiny percentage of surgical patients obtain non-steroidal anti-inflammatory medicines, despite the fact that they are widely accessible. The country's vets appear to have been too concerned about the potential adverse effects of this family of medications, particularly the worsening of bleeding, which has apparently prohibited its customary use as an analgesic in the treatment of pain brought on by surgery. Numerous studies have demonstrated that the occurrence of unfavorable side effects is uncommon in cases of proper use (adherence to dosage and duration of use) and compliance with contraindications (dehydration, hypovolemia, hypotension, coagulation disorders, renal failure, and combined use with corticosteroids or other NSAIDs) [6].

It's crucial to note that prescription painkillers alone are insufficient for the postoperative period; instead, the kind of medication (in light of the type of operation), the dosage and intervals between doses, the length, and the manner of administration must all be carefully considered. To keep the drug's effective plasma concentration stable, adequate dosage and suitable delivery times are required. Drug dosage and dosing intervals were not questioned in the current investigation. It is important to remember that not all patients respond well to medicine administration at specific intervals. Thus the intervals at which painkillers should be given should be decided based on the patient's reaction. In other words, if giving the medication does not result in adequate analgesia, the medication's dose, administration schedule, and even the drug's kind should be reviewed. The overall amount of medicine taken appears to be lower if the medication is provided at regular intervals and before the development of pain sensations. The administration of further doses of medication at regular intervals is less frequently considered when prescribing medications, the current study finds. Instead, medications are typically supplied in a single dose. Additionally, all clinics—with the exception of one—prescribed painkillers the following surgery as far as the timing of the first dosage of medication [6].

Conclusion

The assessment and prevention of pain related to surgical operations have received little attention in the literature so far. Studies on companion animals, experimental animals, and wildlife, as well as the research we discussed above, all point to the fact that postoperative pain is frequently not well managed. To diagnose surgical and postoperative pain more accurately and practically, as well as to provide more effective analgesic therapies for this pain, research on farm animals is required. The development of less intrusive surgical techniques and enhanced training for those who conduct these procedures should go hand in hand with this study. NSAIDs, one of the most significant and quickly expanding medication families, have completely changed both human and veterinary medicine. In addition to being used as anti-inflammatory, anti-fever, and painkillers, these medications are also employed as supporting medications in the treatment of certain malignancies. New NSAID medications with specialized purposes and varied uses in the treatment of various illnesses are likely to be created in the ensuing decades. Like any medications, NSAIDs may have undesirable side effects, but with proper administration, the therapeutic advantages will far exceed the risks. Only a small percentage of people may get major adverse effects with today's NSAIDs due to their decreased hazard. Generally, these medications can be used to relieve pain before or after surgery in animals who do not have renal, digestive, or coagulation issues, are not dehydrated and do not have low blood volume. The use of fluid therapy and blood pressure monitoring during anesthesia is unquestionably advised if these medications are taken prior to anesthesia.

Acknowledgment: NONE

Conflict of Interest: NONE

Funding: NONE

Ethical statements: NONE

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