Block That Pain: Dental Pain Management

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Pain management is more than the latest popular terminology. It is an important part of veterinary dentistry. Many of the procedures performed on animals are painful and it is our duty as technicians to ensure that our patients are as comfortable as possible. The delivery of local nerve blocks prior to performing many dental procedures or oral surgery is a great way to create preemptive analgesia. This can often be incorporated into a multimodal plan for pain control.

Definition

The International Association for the Study of Pain defines pain as an unpleasant sensory or emotional experience associated with actual or potential tissue damage, or described in terms of such damage.

Pathophysiology of Pain In order to manage pain, it is important to have a basic understanding of the complex interactions coming together to create the pain response. This will allow for formulating a plan to control pain prior to a procedure, during surgery and postoperatively. Nociception is defined as the processing of a noxious stimulus resulting in the perception of pain by the brain. Nociception has three distinct physiological processes, transduction, transmission and modulation. ***Transduction*** is the translation of physical energy (noxious stimuli) into electrical activity at the peripheral nociceptor. These receptors are considered mechanosensitive, thermosensitive and chemosensitive. ***Transmission*** transports these impulses along nerve fibers to the nucleus caudalis of the brain. These trigeminal afferent nerves are subdivided into two categories:

- A-delta or fast fibers, responsible for sharp stabbing pain as in a sudden tooth fracture
- C or slow fibers, responsible for dull throbbing pain as in trauma with internal hemorrhage and pressure.

Modulation is the synapse of the neurons in the nucleus caudalis in the medulla of the brain. This leads to the perception of pain. The goal of dental analgesia is to block this perception.

Consequences of Pain

Pain can be pathologic is left untreated. Pain can cause increased risk of infection, delayed wound healing, reduced food and water intake, inability to move, altered sleep patterns and altered behavior patterns. Some or all of these consequences may prolong convalescence and may predispose the patient to an adverse outcome.

Pain Recognition

Physiological signs of acute pain include increase blood pressure and heart rate, peripheral vasoconstriction that manifests itself as blanched membranes. Respiration rates can also increase. The manifestations of pain can be in dogs and cats. Dogs will often whine and whimper, become unusually timid or aggressive, have a fixed stare or have a restless behavior. Cats may purr, growl or groom when in pain. They may try to hide, appear to squint and be resistant to movement. An animal in pain may not have an appetite, have inappropriate urination, or stop grooming themselves.

Pain Assessment
Technicians have the primary role in assessing a patient's pain level. In order to assess a patient's pain level, you need to know what is normal. If at all possible become familiar with a patient presenting physiological values and behaviors at admission. A through pain assessment should include both watching the patient from a distance and an interactive assessment that encourages a response from the patient.

There are simple assessment scales that can be used to record the pain level of the patient. These include a visual analog scale and the numerical rating scale.

Strategies for Pain Management
Pain can be controlled at each of the sites along the pain pathway. Different modalities of treatment can be combined, or used alone, to produce the desired effect in a specific area. Local and regional anesthetics and Alpha-2 agonists will block the transmission of pain. Anti-inflammatory drugs work at the site of transduction and also modulate the pain response. Opioids modulate pain perception centrally and locally.

It is documented that preventing pain will decrease the total volume of required analgesics. If pain control is not started until after a patient is showing discomfort, a higher level of drugs will be needed to stop this increased sensitivity to noxious stimuli in the central nervous system. This is also known as "wind-up". A multi-modal approach to pain management before, during and after a procedure will reduce "wind-up" and provide a more comfortable patient. Combining pain medications and sedatives in the pre-anesthetic protocol will decrease the need for a high concentration of inhalation anesthetics. Providing anti-inflammatory drugs at the beginning or end of a procedure will reduce the local pain response due to tissue manipulation. Instructing clients to follow the suggested dosing schedule of postoperative oral medication will help to eliminate the chance of overdosing a patient.

Pre-anesthetic Drugs:
A many drugs aid in systemic pain control prior to anesthetizing a patient. These include hydromorphone, butorphanol, morphine, medetomidine, etc. All of these drugs work differently in the brain. The drug of choice is determined by many factors including:
- Patient's condition: age, body score, underlying medical conditions, etc
- Cost: some drugs are prohibitively expensive to use in large patients
- Procedure: full mouth extractions are more painful than a single tooth extraction
- Hospital protocols: Use the recommended protocol for your clinic.

It is not within the scope of this paper to cover each of the possible pre-anesthetic drug combinations. Every patient should be evaluated to determine the best choice of pre-anesthetic drugs for each individual.

During the Procedure
Regional and local anesthetic blocks are used in dentistry to control pain at the site of the procedure. The drugs of choice for this procedure are lidocaine hydrochloride 2% and bupivicaine 0.5%. Lidocaine provides a quick onset of action (about 2 minutes). However, its duration is only one to two hours. Bupivicaine has a delayed onset of 4 – 8 minutes. This can be negated by appropriate timing of the injection. The biggest advantage of bupivicaine is its long

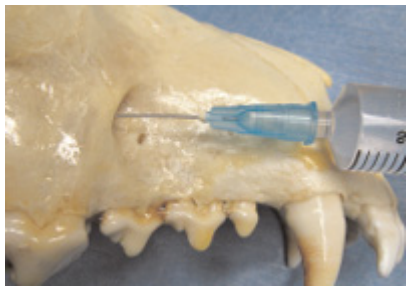
duration of effect (4 – 10 hours.) When using either of these drugs the patient must be monitored very closely. Both can cause cardiac depression, seizures and respiratory distress if given at too great a dose or administered intravenously. The recommended total dosing for bupivicaine is 2.0mg/kg. The total volume per injection site is 0.1ml (cats and small dogs) to 0.3ml for very large dogs. If a patient's mouth is to be blocked in more than one region, caution must be taken not to exceed the maximum dosage.

Regional Blocks
Familiarity with skeletal landmarks is needed prior to performing a regional block. Examination of a dog and cat skull model is helpful. It is imperative to avoid injecting the local anesthetic into a blood vessel to limit any cardiotoxic effects.
If a regional nerve block cannot be performed, individual teeth can be blocked using a field block. A field block is performed by infiltrating the surrounding tissue with the analgesic agent. A field block can be used for the extraction of deciduous teeth.

Materials
The materials needed for intraoral regional blocks are the drug of choice, a 1ml. syringe and assorted needles depending upon the site to be blocked. Generally, a 25g X 5/8" needle is used for most blocks. However, patients with long or large faces may require the use of a 1½" needle. The procedure is described below.

Warning
Although some experts advocate the insertion of the needle deep into the foramen, the techniques described in this text will involve a less invasive technique that will decrease the likelihood of nerve damage while performing nerve blocks

Maxillary Infraorbital Nerve Block
The maxillary infraorbital nerve block will affect the bone, soft tissues and canines and incisors. The infraorbital foramen is readily palpated in the maxilla just distal to the 3rd premolar. The needle is inserted just into the foramen through the buccal mucosa. It is imperative to keep the syringe and needle parallel to the palate and to not advance the needle too far into the foramen especially in cats. The infraorbital foramen is located within 4mm of the medial canthus of the eye. Caution must be used to avoid any ocular injury.



Rostral Maxillary Nerve Block
The rostral maxillary nerve block will affect the bone, teeth and soft tissue rostral to the first maxillary molar on the injected side. The landmarks are caudal to the maxillary 2nd molar. The infraorbital neurovascular bundle is affected by this block. In dogs, the maxillary nerve block is

performed by inserting the needle just caudal and center to the last maxillary molar. Advance the needle dorsally to a level just beyond the root tips of the last molar, then aspirate (3 times) and slowly inject the agent. This technique is preferred over the infraorbital nerve block for providing analgesia to the maxillary molars.

In cats, the rostral maxillary nerve block is performed at the base of the 'V' notch or divot near the soft palate juncture, palpable just medial to the caudal root tips of the maxillary 4th premolar. Aspirate 3 times and inject slowly.

Middle Mental Nerve Block in Cats

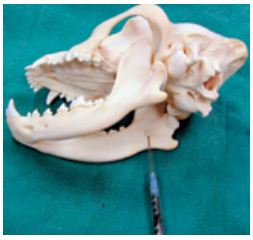
The middle mental foramen is very small and difficult to locate in cats, making this block hard to place. In cats, labial frenulum landmark is used as a guide but the foramen is rarely palpable.

Middle Mental Nerve Block in Dogs

The middle mental nerve block will affect the bone, teeth and soft tissue rostral to the 2nd mandibular premolar (canine tooth in cats) on the injected side. The foramen is found just caudal to the mandibular labial frenulum. It is ventral to the mesial root of the 2nd premolar and generally can be palpated in dogs. Dental radiography can aid in the location of the foramen. The bevel of the needle is passed just over the opening of the foramen and the anesthetic is injected as described above. (Caution must be taken to avoid actually threading the needle into the middle mental foramen. It is a very narrow opening and contains neurovascular structures that must not be macerated.

Mandibular Nerve Block

The mandibular (inferior alveolar) nerve block will affect all bone, teeth and soft tissue of the injected mandible. It can be performed either extraorally or intraorally. The notch of the caudal ventral mandible is palpated just cranial to the angular process. The needle is inserted at the lingual aspect of the ventral mandible and advanced dorsally to the midpoint between the ventral and dorsal borders of the mandible. The needle may be palpated from the inside of the mouth. Injection is as previously described. The intraoral technique requires



palpating the mandibular foramen. It is located on the lingual aspect of the mandible 2/3 of the distance from the last molar to the mandibular angular process (see diagram above). The needle is inserted intraorally on the lingual surface of the mandible adjacent to the foramen. Aspiration and injection is as previously described.

Major Palatine

The major palatine nerve block is used to anesthetize the hard palate and soft tissues of the hard palate. It is located on the palate halfway between the midline and dental arcade at the level of the mesial root of the maxillary first molar tooth in dog and the palatal root of the maxillary fourth premolar tooth in the cat.

Postoperative Pain Control

Upon recovery from anesthesia it is important to keep patients comfortable and slowly encourage return to normal eating habits as soon as they are awake and walking. The short term use of a canned diet or moistened dry kibble will decrease mechanical trauma to the oral surgical site and may be easier to chew. (To avoid dietary upset due to a change from dry to canned food, it is recommended to soak dry kibble until it is soft to allow the patient to be maintained on its same diet.) Many drugs are available for postoperative pain management. The most commonly used medications are non-steroidal anti-inflammatory drugs (NSAIDS) and opioids. An excellent reference for veterinary drugs and dosages is *Plumb's Veterinary Drug Handbook, 6th Edition*; Plumb, Donald, 2008 Wiley-Blackwell Publishing (www.wiley.com)
Non-steroidal anti-inflammatory drugs: NSAIDS are used to treat pain and extreme sensitivity associated with inflammation. Most NSAIDS used in veterinary medicine are Cox-2 selective. The breakdown of arachidonic acid by cyclooxygenase (Cox) enzymes released at the site of surgery produces prostaglandins. Further production is created by the development of cytokines and growth factors at the site. Prostaglandins are a component of the inflammatory cascade and contribute to sensitize neurons to noxious stimuli. Inhibition of Cox enzymes will limit prostaglandin production and painful inflammation is reduced.

Conclusion

In conclusion, dental nerve blocks are inexpensive to perform, easy to master, and have a significant impact on patient comfort. They can become an invaluable part of a balanced anesthetic protocol when combined with other analgesic modalities. A multimodal approach to dental analgesia is desired. The duration and extent of the oral procedure will help to determine the desired drug protocol. The goal is to have a patient that is comfortable, eats well and heals quickly.

References are available from author