BALANCED ANESTHESIA IN SMALL ANIMAL PATIENTS:  
INCORPORATING LOCAL AND REGIONAL ANESTHESIA  
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Key Points:
1. Local and regional anesthetic techniques can improve a patient’s intraoperative hemodynamic stability and post-operative analgesia.
2. Local anesthetics, specifically bupivacaine and lidocaine, remain the agents used most frequently to achieve local and regional anesthesia. The addition of other agents, such as opioid analgesics, for some regional techniques can improve the quality and duration of the analgesia provided.
3. The advantages, risks and contraindications for epidural anesthesia, intravenous regional, peripheral nerve blocks, intra-articular blocks, intrathoracic, intraperitoneal, as well as local infiltration block, should be considered on an individual patient basis.

While local or regional techniques can be used to replace general anesthesia in select cases, they are most commonly used in combination with general anesthetics in small animals. By reducing peripheral sensory input into the CNS, local and regional techniques reduce the quantity of general anesthetic required to maintain anesthesia. As the majority of the physiologic effects produced by general anesthetics are dose-dependent, the patient will experience a reduction in both the cardiovascular and respiratory depression with this multi-modal approach. This is particularly advantageous in patients with underlying cardiopulmonary disease or in cases in which supportive measures such as mechanical ventilation or inotrope administration are contraindicated. Unfortunately, the impact of local/regional anesthesia on general anesthetic requirements will be lost if efforts are not taken to provide the appropriate adjustments in general anesthetic delivery.

In addition to an improvement in the quality of anesthetic recovery, the need for systemic analgesics in the post-operative period is reduced following inclusion of local techniques. For example, it has been shown that the pre-surgical provision of epidural anesthesia for hind-limb orthopedic procedures reduces post-operative systemic opioid requirements in the dog. As systemically administered analgesics are not without side effects, this will improve safety for the patient in the post-operative period. Again, the benefits of this will be lost if patient analgesic requirements are not assessed on an individual basis.

Local anesthetic techniques are unfortunately not without risk. Complications reported following local techniques include prolonged sensory or motor (paresis/paralysis) blockade, inflammation or infection at the site of blockage, and cardiopulmonary arrest. If proper techniques and precautions are followed however, the risks associated with local techniques are extremely low.

When drugs are administered as part of a local or regional technique, the primary site of action are the peripheral sensory nerves. Systemic absorption of drug does occur and depending on the drug, may contribute to the analgesic effect observed. For example, local anesthetics produce complete blockade of sensory nerve fibers, thereby preventing the transmission of painful stimuli however systemic absorption of lidocaine, may be significant with some blocks and some of the analgesia observed may be secondary to its central nervous system effects.
Bupivacaine and lidocaine are the most commonly utilized drugs to provide local/regional anesthesia. The major advantage of the former is their duration of action however in some cases, such as an IV regional block, lidocaine is the preferred agent. Recommended maximum doses, specifically, 2 mg/kg of bupivacaine and 10 mg/kg of lidocaine, should be calculated prior to use. In some cases, in which a fast onset but prolonged duration of effect is desirable; a mixture of lidocaine and bupivacaine may be used. In this case, the potential toxic effects of the drugs should be considered additive and the maximum dose of each agent adjusted accordingly. Of the opioid analgesics, morphine is the preferred drug for use with local anesthetics, due in part to its pharmacokinetic properties and in part due to the extensive experience and literature supporting its use. While there is not strong evidence to support its use as part of a perineural or infiltrative block, the addition of morphine to at least epidural anesthesia reduces intraoperative drug requirements and improves post-operative analgesia.

Lumbosacral epidural anesthesia is a relatively easy, safe and effective technique to provide for a patient undergoing procedures in regions innervated by nerves originating caudal to L2. For procedures in which significant post-operative discomfort is anticipated a combination of bupivacaine (0.5%, 1 ml/kg to a maximum of 8 ml) and morphine (15 or 25 mg/ml, 0.1 mg/kg) is ideal while lidocaine (2%, 1 ml/5 kg to maximum of 8 ml) alone may be more suitable for a case in which minimal impact on ambulation or urination is desired. Contraindications to epidural anesthesia include infection at the site of needle placement, inflammatory CNS disease, and presence of a coagulopathy or sepsis.

Brachial plexus, intercostal, mandibular, maxillary, infraorbital, saphenous, common peroneal, tibial, or digital nerve blocks are all perineural blocks that are described in the literature and if correctly performed can dramatically improve intraoperative quality of anesthesia and post-operative patient comfort. Intraperitoneal and intrathoracic delivery of local anesthetics as either an infusion (lidocaine) or bolus (bupivacaine) can also improve patient comfort post-operatively. Substantial systemic absorption of locals occurs through the peritoneum and pleura, therefore close attention to the total dose of local administered is necessary to avoid toxicity.

References: