**Local-Regional Anesthesia: Practical Implementation**

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Local and regional (L&RA) anesthesia is the technique of applying or infiltrating tissues with a sodium channel blocking agent (most common in veterinary medicine: lidocaine, bupivacaine, ropivicaine) to completely numb a specific area. We can literally take an animal in severe pain, such as broken ribs, and make them comfortable again within minutes. There are several adverse effects of continued pain, many of which delay healing and impact the patient psychologically. Local and regional blocking techniques are one of the few techniques we have to completely stop pain signaling to the spinal cord, further reducing sensitization, which in the worst-case scenario could lead to neuropathic pain. Local and regional blocking used for the anesthetized patient also shows a decrease in mobility and mortality and decrease complication in the post-operative period. There are multiple terms used for differing techniques of L&RA.

*Topical or Surface Anesthesia* is using sodium channel blocking agents in creams or solutions on the skin or mucous membrane providing some relief. Unfortunately, many of the agents we use are not readily absorbed through the skin surface unless left on for quite some time prior. The use of lidocaine patches over wounds or incisions has also been described but has not been found to alleviate the need for other analgesic medications.

*Local Infiltration* is a less precise means of infiltrating tissue with a blocking agent to achieve pain sensation loss. Basically, where the surgeon plans to incise or tissues will be manipulated in a way that causes discomfort the local blocking agent should be used. There are many studies on the efficacy of using this technique for any stable surgical patient. The efficacy of this technique has even found its way into the Pain Management Guidelines published by AAHA.

*Regional or Nerve Blocking* techniques are a bit more precise using anatomical land marks, palpation or devices to infiltrate the blocking solution within millimeters of a nerve. A good knowledge of the nervous system anatomy is desirable before implementing such techniques. It is important we are not piercing the actual nerve or infiltrating the nerve, like commonly done during leg amputations. More recent research has shown the infiltration of the nerve, stretching the fibers can sensitive the remaining nerve component adversely.

*Neuraxial Anesthesia* is the technique of infiltrating blocking agents in the epidural space. This is a very effective technique for essentially anything on the caudal half of the animal and can be useful for such conditions as pancreatitis or thoracotomies when using opioids instead of a blocking agent.

There are a few basic tools one will need for local blocks. Basic tools include: A variety of hypodermic and spinal needle gauges and lengths, preferably luer lock syringes. Red rubber catheters with male end adapters for infiltration OR pre-made wound infusion catheters. For more advanced techniques: A nerve stimulator and ultrasound.

There are a few techniques in veterinary medicine used in practice to reduce the sting of blocking agents, as they are usually a weak base. Adding sodium bicarbonate to the blocking agent does alkalinize the agent for a less dramatic sting in awake patients. When adding sodium bicarbonate, the mixologist should keep in mind some proportional ratios as adding too much can cause precipitation and decrease efficacy. A 1 part sodium bicarbonate to 3 parts blocking agent solution is usually safe and still effective. If the patient is anesthetized you may forgo this technique altogether. If you need a greater volume of the blocking agent and have not added sodium bicarbonate you can add regular saline to the blocking agent at no greater ration than 1:1 or efficacy will be

compromised. There is some evidence that adding saline to the mixture will better facilitate tissue distribution of the blocking agents.

The technique of mixing two different local blocking agents, having one agent with a quicker onset (Lidocaine) and one with a longer onset and lasting effect (bupivacaine), has largely been via summation. There is a larger body of evidence that shows when mixing the two agents the bupivacaine may be washed out of the system before any real beneficial effects. One more practical strategy is to provide the initial 60-90 minutes of anesthesia using a less irritating agent (lidocaine) and then reinject the anesthetized tissue with bupivacaine to provide analgesia well into the postoperative period.

Several adjunctive agents added to local blocking agents have been described and are a favorite technique of the author. Micro doses of opioids (0.005mg/kg buprenorphine or 0.01mg/kg morphine), steroids, and dexmedetomidine (0.25mcg/kg) can dramatically prolonged the effects of local blocks from a couple of hours to 24-48 hours. Another more recent option is NOCITA by Aratana. This is a liposomal bupivacaine solution that last for 72 hours. Although labeled of canine CCL repair and feline fracture repair at this time the author has used it in many other procedures such as hemilaminectomies, general incision closures, dental work and much more. A poster describing the use of the human form of the medication showed analgesic effects last up to 96 hours in mice.

With the insertion of a needle into any tissue we can expect some risk and possible complications. From the needle insertion aspect, we can cause mechanical trauma to several different types of tissue depending on where you are inserting. Most commonly with peripheral blocking techniques we may see nerve injury. This occurs as the needle pierces through the nerve instead of adjacent to the nerve.
We can also cause trauma to the nerve by what is termed *injection pressure*. This is the rate at which the operator of delivering the blocking agent either intra or perineural. We can also see nerve injury what using advanced tools such as a nerve stimulator for electrolocation. In general, if the operator is near the nerve and feels resistance during injection of insertion, like going into a different type of tissue, they should stop and re-adjust the needle placement. Typical compilations from these types of injuries usually manifest 48 hours after the injury as motor loss, the patient biting or scratching at the site from a tingling sensation or injury to the tissue over time form chronic numbness and lack of self-awareness to injury.

Other complications we may see include neurotoxicity. Although evidence has shown that the efficacy of blocking agents (and other medications) used in epidurals with preservatives is the same the preservatives like EDTA has been associated with severe back pain in canine and human studies.

- References available upon request. Please email the author for a copy of the slides for needle insertion sites and techniques at http://www.stephencital.com

**Bupivacaine Body Cavity Analgesia Protocol**

**Usage:** This treatment is to provide local analgesia for the thoracic and abdominal cavities.

**Supplies needed:**
- Bupivacaine 5mg/ml
- 0.9% NaCl
- Sodium Bicarbonate 8.4%
- Sterile syringe
- Sterile needle

**Procedure:**

1. Draw up 1.5mg/kg Bupivacaine, dilute with three parts 0.9%NaCl.
2. Then add 1 part of Sodium Bicarbonate 8.4% to 9 parts Bupivacaine/0.9% NaCL solution.
   (Take your total volume in mls of Bupivacaine/0.9% NaCl solution and divide by 9.)
3. Aspirate the tube per protocol prior to instilling the analgesia solution.
4. This is a per animal dose. If the patient has bilateral chest tubes, divide the dose among them.
5. Infuse the solution slowly over 1-2 minutes.
6. This solution should remain in the pleural space for at least 30 minutes.
7. Aspirate the chest tube per protocol.
8. This treatment should be repeated every 4 hours, as needed for analgesia.
   The total dose of Bupivaciane should not exceed 9mg/kg/day.
9. Please document on the treatment sheet the volume instilled and aspirated.

***Please note:***

- Higher doses of Bupivacaine may cause signs referable to:
  - Neurologic signs
    - Altered mentation, tremors, seizures
  - Cardiovascular signs
    - Myocardial depression, arrhythmias, hypotension
- Some patients may experience stinging when the Bupivacaine solution is administered, so use caution.
- ***Do not use in cats***
- ***Do not use for pericardectomy patients***