

3: BASIC LOCAL ANAESTHETIC BLOCKS FOR SMALL ANIMAL PRACTICE

LOCAL ANAESTHETICS HAVE MANY BENEFITS

- Local anaesthetics completely block nociceptive transduction and transmission. This means that central sensitisation leading to persistent post-surgical pain does not develop (Weinstein et al. 2018).
- Local anaesthetics should be considered as part of every anaesthetic plan. Ask 'Is there a local anaesthetic block that I can use?' (Infographics 1 & 2)
- Local anaesthetics are part of first line treatment in acute pain management. Together with opioids and nonsteroidal anti-inflammatory drugs (NSAIDs), they provide multimodal and preventive analgesia.
- Locoregional blocks are usually simple and cost-effective: most techniques only require a syringe, a needle and the local anaesthetic.
- Locoregional anaesthetic techniques provide excellent muscle relaxation and perioperative analgesia; decrease anaesthetic and opioid requirements while blunting the stress response to surgery and improve anaesthetic recovery (Romano et al. 2016, Warrit et al. 2019). Decreasing anaesthetic requirements may reduce the dose-dependent cardiorespiratory effects of general anaesthetics, therefore improving anaesthetic safety.
- Use of loco-regional anaesthetic techniques has been associated with fewer small animal anaesthetic-related deaths (Redondo 2019).
- There are very few contraindications to the use of locoregional anaesthetic techniques. However, local anaesthetic toxicity must be avoided by calculating the maximum dose prior to use (total local anaesthetic dose administered)
- Negative aspiration of blood should be confirmed before injection to avoid haematoma and accidental intravenous administration. Lack of resistance to injection should be ensured to prevent nerve damage.
- Bupivacaine and lidocaine have been mixed to decrease the onset of action of bupivacaine and to increase the duration of action of lidocaine. However, there is little evidence of this potential benefit, and the duration of action of bupivacaine could be actually decreased with mixing.

Table 1 – Common local anaesthetics used in veterinary anaesthesia and pain management

Local Anaesthetic*	Onset (min)**	Common concentrations (%)	Duration of the block (h)**	Suggested maximum doses (mg/kg)
Lidocaine ¹	5 - 15	1, 2	1 - 2	8
Mepivacaine ¹	5 - 15	1, 2	1.5 - 2.5	4
Bupivacaine ¹	10 - 20	0.25, 0.5, 0.75	4 - 6	2
Ropivacaine	10 - 20	0.5, 0.75	3 - 5	3
Levobupivacaine	10 - 20	0.5, 0.75	4 - 6	2

*Volumes of injection vary according to the technique, individual anatomy and body weight. For example, volumes of 0.25-1 mL are used for dental local blocks, whereas intraperitoneal techniques use 2 mg/kg of bupivacaine in dogs and cats. **The onset and duration of action may vary according to the technique, drug concentration, injectate volume, proximity to the nerve, etc. ¹ Indicates veterinary-licensed formulation available

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CLINICAL PROBLEM: LOCAL ANAESTHETICS ARE WIDELY AVAILABLE BUT NOT OFTEN USED

- A survey performed by the World Small Animal Veterinary Association Global Pain Council showed that local anaesthetics are readily available regardless of the region of the world. However, their use was ranked lower than other analgesic treatment modalities (World Small Animal Veterinary Association Global Pain Council Survey). The primary limiting factor to the use of local anaesthetics was the lack of familiarity with use and/or protocols involving these drugs.
- It is a welfare concern that local anaesthetic techniques are not used routinely for treatment of perioperative pain in small animals despite good evidence for their use and wide availability.
- Basic local anaesthetic techniques should be used routinely, this would confer a significant benefit to canine and feline welfare.

SIMPLE, COST-EFFECTIVE AND PRACTICAL LOCAL ANAESTHETIC TECHNIQUES FOR EVERYDAY PRACTICE

SPAY-NEUTER AND/OR ABDOMINAL SURGERY

- Intraperitoneal analgesia and incisional anaesthesia (Figures 1 and 2)

- The World Small Animal Global Pain Council published a short review on the use of intraperitoneal (IP) analgesia and incisional anaesthesia with clinical recommendations and current evidence for these techniques in small animal practice (Steagall et al. 2020). A summary of these recommendations is provided below:
 - These techniques should be used for any type of abdominal surgery and sterilisation program, especially in cases of analgesic shortage or unavailability, using aseptic conditions and general anaesthesia.
 - These techniques should be used in addition (and not as replacement) to other analgesics such as NSAIDs. For example, intraperitoneal analgesia and incisional anaesthesia should be used as part of a multimodal analgesic plan (Benito et al. 2016, 2018).

- Doses suggested for these blocks are 2 mg/kg for bupivacaine and 8 mg/kg of lidocaine. Higher doses have been used but without safety data reporting. If both techniques are used, one quarter of the total volume is administered for incisional anaesthesia with the remaining volume used for intraperitoneal analgesia.
- In cats and small dogs, bupivacaine 0.5% can be diluted in equal parts with saline to increase the volume of IP injection. The final concentration before drug administration is then 0.25% (Benito et al. 2018).
- Based on the concept of pre-emptive analgesia, preoperative administration of incisional anaesthesia is preferred over postoperative use (Savvas et al. 2008).
- Incisional anaesthesia is accomplished by infiltrating the wound or the skin over the surgical field with local anaesthetic. The technique has been used most often before celiotomy, but it can be also applied for any skin sutures; for example, before chest tube placement and similar procedures.
- Anecdotally, wound dehiscence has been a concern after local anaesthetic infiltration. This potential issue is not supported by scientific evidence. In one study, administration of local anaesthetic via wound soaker catheters did not increase the prevalence of wound dehiscence nor incisional infection rate in dogs and cats undergoing limb amputation (Abelson et al. 2009).
- The incisional anaesthesia block in a cat can be watched at <https://www.youtube.com/watch?v=43Km46WJ2zI>
- For intraperitoneal analgesia, the local anaesthetic is splashed into each ovarian ligament and on the neck of the uterus before excision of ovarian pedicles and uterus during ovariohysterectomy. The technique is performed under general anaesthesia to avoid laceration or puncture of abdominal organs and peritonitis.
- The intraperitoneal analgesia block in a cat can be watched at <https://www.youtube.com/watch?v=eLa1UxWboh0>

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- Intratesticular block (Figure 3)

- The intratesticular block is indicated for anaesthesia of the testicles in dogs and cats undergoing castration. This block blunts the stress response to surgical castration, decreases intra- and post-operative pain and the need for rescue analgesia. There is a decrease in inhalant anaesthetic requirements during surgery (McMillan et al. 2012, Huuskonen et al. 2013, Fernandez-Parra et al. 2017, Kushnir et al. 2017).
- Under general anaesthesia and aseptic conditions, a 23-G or 25-G needle is inserted into the testicular parenchyma. In general, a male cat and small dog will require approximately 0.25-0.5 mL of lidocaine 2% per testis, while a medium or large-sized dog will need up to 0.75 mL per testis.

TWO MAIN DENTAL NERVE BLOCKS IN DOGS AND CATS

Reference to canine and feline skulls will facilitate learning and appropriate location of landmarks before applying these techniques in clinical practice. Bilateral nerve blocks can be performed for dental extractions. Maximum doses of local anaesthetics should be calculated for all blocks before drug administration (Table 1).

- Infraorbital nerve block (Figure 4)

- The infraorbital nerve is a branch of the maxillary nerve which supplies sensory innervation for the maxillary teeth and lateral gingiva.
- The caudal superior alveolar nerve leaves the infraorbital nerve before it enters the infraorbital canal, while the middle superior alveolar nerve branches off just after the nerve enters the canal.
- The rostral superior alveolar nerve branches off just before the nerve exits the canal and supplies the canine and incisor teeth.
- Local anaesthetic injection into the infraorbital foramen should block the canine and incisor teeth and the rostral premolars, but not the 4th premolar or molar teeth. A maxillary nerve block is required to block these teeth, but the results are less consistent (Pascoe 2016).

- The most reliable method is to use a flexible catheter (e.g. a 22G 1.8") introduced into the infraorbital canal through the gingival mucosa and advanced until the tip of the catheter is approximately at a point on a line drawn vertically from the lateral canthus of the eye (Viscasillas et al. 2013).
- In brachycephalic dogs and in cats, the infraorbital canal is short. A 25 or 27-gauge needle may be more appropriate in these cases. Caution is required not to advance the needle too far to prevent penetration of the eye.
- Volumes of injection range from 0.25 mL (small patients) to 0.5 mL (medium and large patients) of lidocaine (short-acting) and bupivacaine (long-acting).
- The intra-oral technique without the introduction of a catheter can be watched at <https://www.youtube.com/watch?v=H3L1LHBcM-g>

- Inferior alveolar nerve (mandibular) block (Figure 5)

- This technique removes sensation from the gingiva and teeth in the mandible. The inferior alveolar nerve arises from the ventral branch of the mandibular nerve. It is typically blocked close to the point where it enters the mandibular foramen.
- Using an intraoral approach, the nerve can be palpated on the medial aspect of the mandible just rostral to the angular process in dogs, but rarely in cats. For both intra and extraoral approaches, the needle is advanced percutaneously from the ventral border of the mandible, along the medial surface of the mandible until the level of the mandibular foramen. For the intraoral approach, the tip of the needle can be palpated close to the nerve with the other hand inside the mouth.
- In dogs, a concavity on the ventral border of the mandible (i.e. vascular notch) is a good landmark for needle placement, but this concavity is less commonly appreciated in cats.
- Volumes of injection range from 0.25 mL (small patients) to 0.5 mL (medium and large patients) of lidocaine (short-acting) and bupivacaine (long-acting).
- The extra-oral technique can be watched at <https://www.youtube.com/watch?v=2q8ndh5Bn6U>

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SUMMARY

Local anaesthetics are key players in the first line of acute pain treatment along with opioids and NSAIDs and should be routinely used in general practice.

Local anaesthetics provide a wide range of benefits including analgesia, muscle relaxation and decreases in anaesthetic and analgesic requirements. There are simple, practical and cost-effective locoregional anaesthetic techniques that are easily incorporated into clinical practice. Addition of local anaesthetic techniques to multimodal analgesia improves perioperative analgesia and improves canine and feline welfare, particularly in countries with limited analgesic availability.

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