44

Local analgesia

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Indications for local analgesia

Local analgesia is an underused technique that can greatly enhance the overall analgesia in a patient, can lead to use of less systemic drugs, and may be used in situations in which sedation, heavy systemic analgesia, or anesthesia is contraindicated.[1] Many animals that present to the emergency department are in shock, and those that are not in decompensated shock may be in compensated shock.[2] Those in compensated shock are able to compensate because their sympathetic nervous system is maintaining their blood pressure and helping to maintain their oxygen delivery.[3] In the intensive care unit, critically ill animals are dynamic with potentially minute-to-minute changes in cardiac output, blood pressure, and oxygen delivery. Almost all sedatives, analgesics, and anesthetics blunt the sympathetic nervous system to some extent.[4–20] This effect puts animals in the emergency department and critical care unit at risk for decompensation when receiving systemic drugs for analgesia, sedation, or anesthesia. Local analgesic techniques may aid in decreasing systemic drug requirements in these patients.[1] Although shock patients in general are at risk for systemic decompensation with systemic sedatives and anesthetics, there are specific conditions in which these drugs should be particularly avoided or delayed if at all possible. Specific examples include head trauma, pulmonary contusions, pneumothorax, myocardial contusions (and subsequent arrhythmias), diaphragmatic hernia, liver fractures, splenic fractures, urinary tract rupture, severe anemia/hypoproteinemia, and neurologic abnormalities. Avoidance of anesthesia and sedation in these situations is beneficial because anesthetic drugs can worsen/induce arrhythmias, positive pressure ventilation may contribute to or worsen pneumothorax, lungs that have pulmonary contusions are more prone to atelectasis and subsequent hypoxemia, anesthetic drugs can alter blood flow to the brain and worsen head trauma/neurologic status, urinary tract injuries may cause severe life-threatening electrolyte disturbances (especially hyperkalemia), and liver/spleen fractures may lead to intraoperative hemorrhage and hypotension.[14,15,17,18] In addition, many anesthetic drugs are protein bound and become more bioavailable in animals that are acidotic, a common consequence of shock and trauma.[7,14,15,18] Avoidance of anesthesia until full assessment and proper resuscitation is attained is critical. However, sometimes sedation or anesthesia in these patients cannot be avoided. Use of local analgesic techniques in these life-threatening situations frequently decreases the need for systemic drug use and makes for a safer overall procedure.[1]

Because local anesthetics directly block nerve impulses, they decrease pain in an alternative way compared with systemic analgesics.[8,21] When used preemptively, this decreases the likelihood of wind-up of the pain pathways, ultimately helps prevent hyperalgesia, and aids in the multimodal approach to patient analgesia.[8]

Drug choices

Drug selection (see Table 44.1) is an important part of the local anesthetic protocol. Local anesthetics work by blocking nerve impulses.[7,8,21] At a cellular level this occurs by blocking sodium channels in the nerve membrane.[8] When sodium is blocked, the nerve cannot

Advanced Monitoring and Procedures for Small Animal Emergency and Critical Care, First Edition. Edited by Jamie M. Burkitt Creedon, Harold Davis.

Table 44.1 Listing of various drug dosages for local anesthetic use (for continuous epidural drug protocol, see the section on epidural)

Drug	Dosage	Use
Lidocaine	1–2 mg/kg	Short-acting analgesia for local infiltration, intrapleural and intraperitoneal blocks, and occasionally epidural use
Bupivicaine	1–2 mg/kg	Longer acting analgesia for local infiltration, intrapleural, intraperitoneal, and epidural use
Dexmedetomidine	0.001–0.005 mg/kg	Epidural, intraarticular, or perineurally
Preservative-free morphine	0.1 mg/kg	Epidural
Fentanyl	0.01 mg/kg	Epidural
Buprenorphine	0.003–0.006 mg/kg	Epidural

conduct an impulse, and therefore no sensation can be transmitted. Local anesthetics cause analgesia but also can cause complete loss of motor function depending on the properties of the drug, location, myelination of the nerve, dose, and size of the nerve fibers.[22] Generally, local anesthetics cause nerve blockade in a particular order by first numbing pain, then warmth, touch, deep pressure, and finally motor function.[22] However, large peripheral nerves are an exception to this and tend to have motor blockade before sensory blockade, as well cause proximal extremity analgesia prior to distal extremity blockade.[22] Local anesthetic drugs differ in their side effects, onset of action, and duration of action. Consideration of these drug factors should influence drug selection.[23]

Lidocaine

Lidocaine is a commonly used local anesthetic that belongs to the amino amide group, meaning it is generally biotransformed by liver microsomal enzymes.[22] It is available in concentrations of 0.5% to 5% with or without epinephrine.[22] In addition to the injectable lidocaine, various forms of lidocaine can also be found: dermal patches, oral gels, topical gels, and nasal sprays. Lidocaine has an onset of action of 5–10 minutes and duration of action of 60–120 minutes.[22] Dosing of lidocaine for local infiltration is generally 1–2 mg/kg in both dogs and cats.[7] Adverse drugs reactions are uncommon when lidocaine is used as a local anesthetic. Most reactions are associated with accidental intravenous (IV) injections, so care should be taken to avoid this when local effects are the goal. In dogs, intravenous administration of lidocaine at a dose of 22 ± 6.7 mg/kg induces convulsions and other signs of central nervous system (CNS) toxicity, such as salivation and muscle tremors.[24] In cats, intravenous administration of lidocaine at a dose of 11.7 ± 4.6 mg/kg induces convulsions.[23] Based on these results, dogs should not exceed a dose of 12 mg/kg IV, whereas cats should not exceed a dose of 6 mg/kg IV.[23] Lidocaine with epinephrine should not be used in distal extremities due to vasoconstriction and potential tissue necrosis.[25]

Bupivacaine

Bupivacaine hydrochloride is a long-acting local anesthetic that also belongs to the amino amide group and is four times more potent than lidocaine.[22] It comes in three different concentrations, 0.25%, 0.5%, and 0.75%, available with or without epinephrine. Bupivacaine has an onset of action of 20–30 minutes and duration of action of 180–480 minutes. Dosing of bupivacaine is 1–2 mg /kg, which is similar to lidocaine even though it is four times more potent. Therefore, caution must be taken if repeat doses are necessary because the CNS toxic dose of bupivicaine is much lower than lidocaine at 5 mg/kg.[24] Bupivacaine is contraindicated for IV regional anesthesia (IVRA) because of the potential risk of tourniquet failure and systemic absorption of the drug. It should be clarified that although bupivicaine has a greater arrhythmogenic effect than lidocaine, it has been shown to cause less hypotension systemically than lidocaine in the cat.[26] Additionally, on an equipotent basis, the seizure threshold is similar for both bupivacaine and lidocaine.[26] Accidental IV injection of bupivacaine is cardiotoxic and may lead to death; therefore, aspiration before injection is crucial. Bupivacaine with epinephrine should not be used on distal appendages due to its vasoconstrictive properties and the potential for tissue death.[25]

α-2 adrenergic agonists

The α-2 adrenergic agonists, such as dexmedetomidine, are typically used systemically for sedation and analge-

sia. However, there are α-2 receptors present in the spinal cord (epidurally and intrathecally) that are crucial in the pain pathways.[8] These can be stimulated by epidural or intrathecal infiltration of α-2 agonists, although systemic uptake is always a possibility and must be anticipated.[8] The use of α-2 adrenergic receptor agonists (in combination with amino amide local anesthetics or locally administered opioids) is a useful adjunct in optimizing local anesthetic technique for intra-articular pain control.[27] The use of these drug combinations produces a synergistic analgesic effect and is partly due to norepinephrine inhibition at the nerve endings.[8] The α-2 agonists also enhance peripheral nerve blockade when combined with amino amide local anesthetics.[8] This enhancement is multifactorial but is mostly due to enhanced nerve blockade. Adding α-2 agonists to brachial plexus, intercostal, and dental nerve blocks can enhance the analgesia of these procedures.[8] Doses of dexmedetomidine vary depending on the regional block being performed. The doses range from 0.001 to 0.005 mg/kg.[8] Adverse effects should be anticipated when using an α-2 adrenoceptor agonist as a local anesthetic. Systemic effects to watch for include cardiovascular and respiratory effects, such as bradycardia, decreased cardiac output, and decreased respiratory rate.[6,7]

Opioids

Regional anesthesia, affecting a large part of the body or blocking many nerves, can be enhanced with administration of opioids (preservative-free morphine, fentanyl, or buprenorphine) when combined with an amino amide local anesthetic.[8] Opioid administration alone into the epidural or intra-articular space or in combination with α-2 agonists also are acceptable local analgesia techniques.[8] The onset of action for most regional blocks is 30–60 minutes. The duration of action is approximately 18 hours when using preservative-free morphine, and the duration and extent of analgesia can be extended when using drugs in combination.[8] Adverse effects of opioids when used in this route of administration are rarely problematic.[28] Urine retention is possible after epidural morphine administration, and the bladder may need to be manually expressed or catheterized.[28] Other effects such as sedation, vomiting, defecation, constipation, and histamine release may be appreciated but are uncommon.[28] In regard to histamine release, pretreatment with an antihistamine is usually not indicated unless mast cell tumors are of concern. If degranulation of a mast cell tumor is of concern, pretreatment with diphenhydramine at 1–2 mg/kg intramuscularly is recommended.

Local blocks

Specific local blocks are discussed in the following sections. There are various ways to approach each technique, and common sense is important when choosing to use a local anesthetic block. Many of the blocks require general anesthesia, which may be contraindicated in the emergency patient. Additionally, local anesthetics in and of themselves can be painful, so keep this in mind when performing the blocks. Some authors recommend combining sodium bicarbonate with the local anesthetic to reduce the pain of injection; however, this can decrease the efficacy of the local anesthetic and thus is not discussed in this chapter.[22] Lastly, it is imperative that the patient be monitored for proper analgesia after a local block is performed because the block may not have worked properly or may not last as long as anticipated. The technician and clinician should have a standardized method of evaluating the patient for pain. Most hospitals have a systematic approach for assessing pain in their patients. Listed are a few examples that can be readily implemented. Palpate or gently apply pressure to the affected area, watch for a reaction, such as withdrawing the limb, whimpering, or vocalization, the patient looking at the affected area or seeming concerned. Other signs to observe are increases in heart rate, an overall sense of uneasiness, not being able to get comfortable, and vocalization of pain. Cats frequently exhibit pain by not moving or hiding in the back of a cage. Therefore, systemic pain medications are still required in these situations, as well as when the local anesthetic wears off. It should be noted that subcutaneous injection of local anesthetics has a much lower risk of toxicity than intrapleural or intraperitoneal injection due to differences in systemic absorption. This must be kept in mind when total and repeat doses are calculated.

Local infiltration, incisional blocks, ring blocks

Indications

Local infiltration, incisional blocks, and ring blocks are the simplest to perform of all the blocks (Protocols 44.1–44.3). They are infiltrative blocks at the site of the wound/incision and help control the pain associated with wound debridement and management. Such blocks may reduce the need for heavy sedation when repairing a laceration in an animal that is in compensated shock. The most common indications for these blocks in the emergency setting are lacerations, wounds, incisions, toe wounds and amputations, and tail wounds and amputations.

Protocol 44.1 Local infiltration/line block

Procedure

1. Clip affected area.
2. Aseptically prepare area.
3. In one syringe, prepare mixture of 2% lidocaine 1–2 mg/kg and 5.0% or 7.5% bupivacaine 1–2 mg/kg (bupivacaine with epinephrine is suitable, as long as it is not a distal extremity). The volume needed depends on the size of the area being blocked. Alternatively, this block may be performed with single agent lidocaine or bupivicaine at the above doses.
4. With a syringe attached to a 25-gauge, ⅝-inch or a 22-gauge, 1-inch needle, insert needle subcutaneously, aspirate, inject mixture as you withdraw needle, and make a small bleb.
5. Repeat this procedure around the target area, in a rectangular or circular pattern. Make sure to split the dose of your drug equally throughout the area. It is always a good idea to anticipate how big of an area you will be blocking so that you do not exceed your total dose.
6. If your target area is a surgical incision, inject mixture along the incision, using either a 25-gauge, ⅝-inch or a 22-gauge, 1-inch needle (size depends on the size of the animal).
7. It is ideal to make these injections before the surgical process had begun; however, these blocks are still beneficial if done after the surgical procedure.
8. Alternatively, you can use a 22-gauge, 1.5- to 3.0-inch spinal needle (length depends on size of incision). Insert entirety of spinal needle under the skin, aspirate, and inject mixture as you remove the needle from the skin.

Protocol 44.2 Ring block

Procedure

1. Clip area distal to affected area, 360°.
2. Aseptically prepare site.
3. Prepare mixture of 2% lidocaine 1–2 mg/kg and 7.5% bupivacaine 1–2 mg/kg in a single syringe. Alternatively, this block may be performed with single agent lidocaine or bupivicaine at the above doses.
4. With the syringe attached to a 25-gauge, ⅝-inch needle, insert needle subcutaneously.
5. Aspirate; inject mixture as you remove the needle from the skin until a small bleb is formed.
6. Reinsert needle through first bleb, the area of skin that is already desensitized, and inject in the neighboring skin.
7. Repeat steps until you have injected around the circumference of the affected limb.

Protocol 44.3 Soaker catheters

Procedure

1. Soaker catheters can be placed in the subcutaneous tissue for local infiltration when closing an incision for repeat or continuous local anesthetic infiltration.
2. Aseptically prepare site.
3. Place soaker catheter in the subcutaneous space.
4. Suture in place using a Chinese finger trap technique.

Contraindications

There are few contraindications to these simple blocks. There is some evidence that local anesthetics can interfere with wound healing, which should be kept in mind.[29,30] Additionally, if an area is infected, ring blocks and local infiltration should probably be avoided.

Complications

Infection, pain on injection, decreased wound healing,[29,30] drug reaction, bleeding, ineffective block, and clogging of the catheter if using a soaker catheter are possible complications.

Intrapleural blocks

Indications

Intrapleural blocks are usually performed through a chest tube (see Fig. 44.1) that has already been placed and is the mainstay of intrapleural blocks in veterinary medicine (Protocol 44.4). The use of a syringe and needle directly through the thoracic wall can be used to infiltrate the pleural space. However, this direct technique is rarely used and not discussed further.

Figure 44.1 Intrapleural block. A dog receiving an intrapleural block through a chest tube.

Protocol 44.4 Intrapleural block

Procedure

1. Aseptically prepare chest tube for injection.
2. Aspirate and remove any fluid or air from the pleural space through the chest tube.
3. Slowly inject a combination of 1 mg/kg of lidocaine mixed with 1 mg/kg of bupivacaine. Your total dosage should not exceed 2 mg/kg. If you prefer to use a single agent, inject 2 mg/kg of lidocaine or 1.5 mg/kg of bupivicaine.[32,33] If bilateral chest tubes are placed, simply divide the drug in half and administer one half of the drug into each chest tube. The bupivacaine alone may sting if it is not given with the lidocaine. Lidocaine alone will only last 30–60 minutes, whereas addition of bupivacaine will extend the analgesia to 4–6 hours.
4. Follow the injection with 5 mL of sterile saline or air to clear the chest tube of the local anesthetic and ensure dispersion into the thoracic cavity.
5. The block may be more effective if you lay the animal down in lateral recumbency for 10–15 minutes after the block, with the affected side down.

Contraindications

Flail chest may be a contraindication because the body wall may not be intact and the local anesthetic may leak into the subcutaneous space. There is no evidence that intrapleural lidocaine or bupivicaine at therapeutic doses given to patients with pericardectomy increases the risk of dysrhythmias.[31]

Complications

Complications include pain on injection, incomplete block, cardiac toxicity, and pyothorax.

Intercostal nerve blocks

Indications

Intercostal nerve blocks (Protocol 44.5) can be performed on any intercostal nerve and generally block structures as far as two rib spaces caudal to the block. These can be useful for broken ribs or cranial abdominal pain.[33]

Contraindications

Flail chest and infection are contraindications for this procedure.

Complications

Pneumothorax and bleeding are the complications.

Protocol 44.5 Intercostal nerve blocks

Procedure

1. Two adjacent intercostal spaces (see Figs. 44.2 and 44.3) both cranial and caudal to the incision or area of discomfort must be blocked due to the nerve supply overlap.[33]
2. Using a 90° angle, insert a 25-gauge, ⅝-inch or a 22-gauge, 1-inch needle through the skin caudal to the rib near the intervertebral foramen.
3. Aspirate, and if no blood is withdrawn, then inject 0.5–1.0 mL 7.5% bupivacaine (volume depends on the size of the animal) at each site. Your total dosage should not exceed 2 mg/kg.

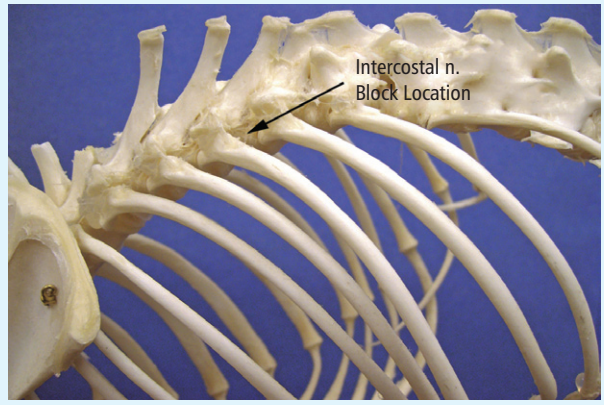

Figure 44.2 Intercostal nerve block. Location of the intercostal nerve on a dog skeleton.

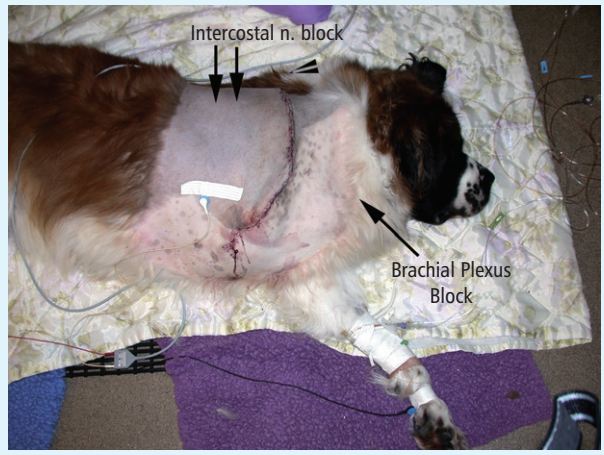

Figure 44.3 Intercostal nerve block and brachial plexus block. Examples of the location of an intercostal nerve block and brachial plexus block on a live dog. The brachial plexus block is performed medial to the shoulder joint with the needle inserted caudally toward the costochondral junction of the ribs.

Protocol 44.6 Brachial plexus block without the use of a nerve locator

Procedure

1. With the patient in lateral recumbency, affected leg up, clip area medial to the shoulder joint.
2. Aseptically prepare site.
3. After washing hands and while donning sterile gloves, insert a 22-gauge, 1.5- to 3.0-inch spinal needle (depending on size of patient) medial to the shoulder joint with the needle pointing caudally toward the costochondral junction of the ribs (Fig. 44.3) and the shaft of the needle parallel to the vertebral column.
4. Once needle is fully inserted, aspirate. If no blood is noted, inject bupivacaine, 2 mg/kg, 7.5% concentration, as you slowly withdraw needle.[3]

Protocol 44.7 Brachial plexus block with the use of nerve locator

Procedure

1. Clip area medial to the shoulder joint.
2. Aseptically prepare site.
3. Attach nerve locator surface electrode to patient.
4. Prime insulated needle delivery set with 7.5% bupivacaine, about 0.5 mL or until bupivacaine is observed at the tip of your needle.
5. Using sterile gloves, insert insulated needle (size 40 mm, 80 mm, or 100 mm, depending on patient size; the distal tip of the needle should lie just caudal to the spine of the scapula) medial to the shoulder joint with the needle pointing caudally toward the costochondral junction of the ribs and the shaft of the needle parallel to the vertebral column.
6. Once the needle is placed through skin, attach the nerve locator to the uninsulated part of the needle.
7. Turn nerve locator on and apply settings at 1 mA (2 Hz).
8. Continue to insert the needle until you obtain contractions of the biceps brachii muscle and flexion of the elbow.
9. Once desired effect is obtained, slowly decrease nerve locator setting until you achieve same muscle contraction and elbow flexion at a mA of 0.5. If the technician is getting a positive stimulation at 0.2 mA, it may indicate an intraneural needle placement.
10. Aspirate. If no blood is observed, inject bupivacaine (2 mg/kg, 7.5% solution) slowly. There should be no resistance while injecting the bupivacaine.
11. Once nerve twitch dissipates, slowly withdraw needle while still injecting bupivacaine as the needle is removed.[34]

Protocol 44.8 Intraperitoneal block

Procedure

1. Position the animal in lateral recumbency.
2. Aseptically prepare site around the umbilicus.
3. Using a 90° angle, insert a 22-gauge, 1 or 1½-inch needle through the skin just ventral to the umbilicus until the needle is within the peritoneal cavity. Depending on the thickness of the subcutaneous tissue, a 1-inch needle usually penetrates into the peritoneal cavity. Usually there is a small loss of resistance as the needle breaks through the parietal peritoneum.
4. Aspirate once in the abdominal cavity. If fluid is aspirated, then do not inject. Commonly the spleen or bladder is hit accidentally with the needle and the procedure needs to be redirected. An ultrasound machine is helpful to determine if fluid is already present within the abdominal cavity prior to injection to know if fluid is expected on aspiration. If no fluid is aspirated or known fluid is present via ultrasound verification, inject 0.5–1.0 mL 7.5% bupivacaine diluted into 9 mL of 0.9% NaCl (amount of bupivacaine depends on the size of the animal). Your total dosage should not exceed 2 mg/kg.

Brachial plexus block

Indications

The brachial plexus nerve block is for procedures occurring distal to the elbow (Protocols 44.6 and 44.7).

Contraindications

Injuries or procedures proximal to the elbow, coagulopathy, and thrombocytopenia are the contraindications. General anesthesia is usually required, so this block may be of limited use in the emergency patient.

Complications

Hemorrhage, incomplete nerve block, and brachial plexus nerve damage are the complications.

Intraperitoneal blocks

Indications

Most intraperitoneal blocks (Protocol 44.8) are performed in animals that have severe abdominal pain secondary to pancreatitis.

Contraindications

Septic abdomen, abdominal wall hernia, thrombocytopenia, and coagulopathy are all contraindications.

Complications

Failure of blockage due to dilution of the local anesthetic within the peritoneal cavity, pain on injection, septic abdomen, and hemoabdomen are complications.

Infraorbital, mandibular, and mental nerve blocks

Indications

The infraorbital nerve block (Protocol 44.9) numbs the maxilla on the side of the block, including the teeth cranial to the maxillary first molar.[35] The mandibular nerve block (Protocol 44.10) numbs the mandible cranial to the injection site, including the teeth and tongue on the affected side.[35] The mental nerve block (Protocol 44.11) numbs the skin, bone, and teeth of the mandible cranial to the second premolar on the ipsilateral side (Fig. 44.4A).[35]

Contraindications

The mandibular nerve block frequently needs to be done under anesthesia and therefore has limited value in the emergency patient. The infraorbital nerve block and mental nerve block should be performed under heavy sedation. Mental nerve blocks for dental work involving symphyseal fractures may not cause complete analgesia of the symphyseal fracture site because the mental nerve innervates the lateral mandible.[8,35]

Complications

Incomplete nerve block, hemorrhage, and permanent nerve damage are complications. Permanent nerve damage could cause lip drooping and numbness, which could cause self-trauma if the animal accidentally bites or chews its lip.

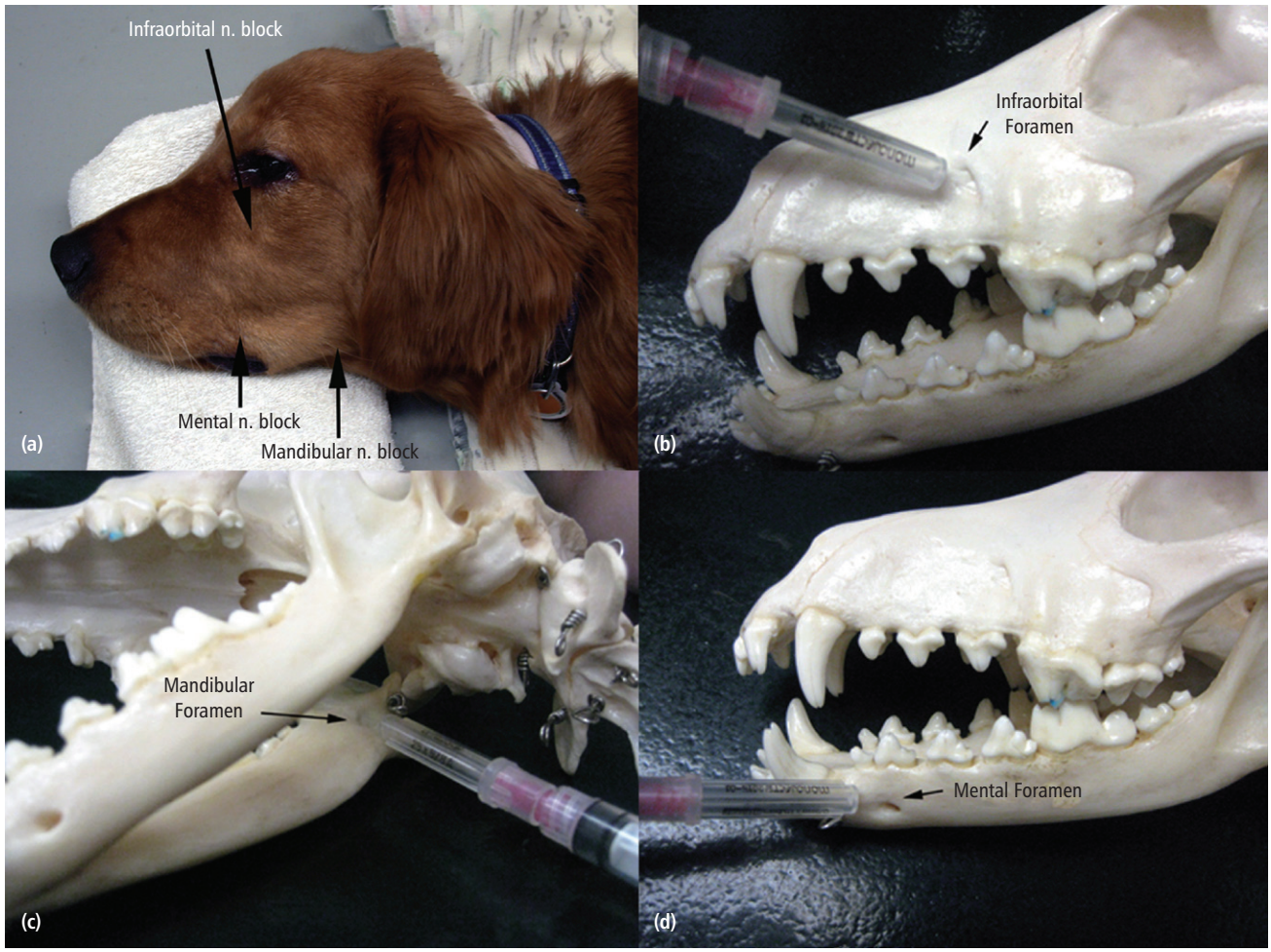

Figure 44.4 Dental nerve blocks. (a) Locations of the three dental nerve blocks on a live dog: infraorbital, mental, and mandibular nerve blocks. (b) Infraorbital block. Skull picture depicting location of the infraorbital foramen. (c) Mandibular block. Skull picture depicting location of the mandibular foramen. (d) Mental block. Skull picture depicting location of the mental foramen.

Protocol 44.9 Infraorbital block (see Fig. 44.5)

Procedure
1. Aseptically prepare site.
2. Lift the patients lip and palpate the infraorbital foramen, which can be located dorsal to the rostral edge of the upper forth premolar (see Fig. 44.4B).
3. Using 1–2 mL of 2% lidocaine or 7.5% bupivacaine, or a mixture of both, insert a 22-gauge, 1-inch needle (or 25-gauge, 5/8-inch needle, depending on the size of the patient) into the infraorbital space.
4. Once you have entered the infraorbital space, insert the entirety of the needle, and aspirate; if no blood is observed, inject desired drug.

Protocol 44.10 Mandibular block

Procedure
1. Place your patient in lateral recumbency with the affected side up.
2. Open the patient's mouth and advance your index finger on the medial aspect of the ramus of the mandible, to the palpable lip of the mandibular foramen, which is caudal to the third molar (see Fig. 44.4C). The mandibular nerve is usually palpable at this point.
3. With your index finger in place, using aseptic technique, use your other hand on the exterior of the mouth, at the point of the mandibular foramen. Under the jaw insert a 25-gauge, 5/8-inch, or a 22-gauge, 1-inch needle (size of needle depends on size of patient) at the lower angle of the jaw slightly rostral to the angular process on the medial aspect of the ramus. You should be able to feel the tip of the needle with your index finger that is inside the patient's mouth.[36]
4. Once the needle has been palpated, aspirate; if no blood is observed, inject 1–2 mL of 2% lidocaine or 1–2 mL 7.5% bupivacaine, or a mixture of both, remembering not to exceed a total dose of 2 mg/kg.

Femoral and sciatic nerve block

Indications

The femoral and sciatic nerve blocks (Protocols 44.12 and 44.13) are useful for procedures including the stifle and distal to the stifle.

Contraindications

Infection at the injection site, coagulopathy, thrombocytopenia, inability to use contralateral hind limb, and direct nerve injury are contraindications. Complications: include hemorrhage, incomplete block, and nerve damage.

Protocol 44.11 Mental block

Procedure
1. The mental foramen is caudal and ventral to the canine tooth (see Fig. 44.4D).
2. Insert a 25-gauge, 5/8-inch needle intraorally, parallel to the teeth, rostral to the mental foramen.
3. Aspirate; if no blood is observed, inject 0.5–1.0 mL of 2% lidocaine or 0.5–1.0 mL of 7.5% bupivacaine or a mixture of both. Do not exceed a total dose of 2 mg/kg.

Epidural and epidural catheter

Indications

Epidural blocks (Protocols 44.14–44.16) can be performed when a patient has pelvic limb pain, abdominal pain, thoracic pain, or thoracic limb pain.

Contraindications

Local infection, systemic infection, severe pelvic fractures that disrupt the anatomy, coagulopathy, thrombocytopenia, and hypotension are contraindications. This procedure must be performed under general anesthesia.

Complications

Complications include infection, bleeding, incomplete block, urine retention if using opioids, and intercostal nerve root paralysis if using a large volume and a local anesthetic is included. It is recommended that the concentration of bupivacaine not exceed 0.25% if the catheter placement is near the thoracic vertebrae.[28]

Troubleshooting

If an epidural catheter stops functioning, first radiograph the animal to determine if placement of the catheter is correct. Fluoroscopy may be more helpful than a radiograph because of the ability to move the animal around to help determine placement. If the catheter appears in place, attempt to gently flush with sterile saline. If this does not work, then attempt flushing with saline as the epidural catheter is slowly removed. Do not force or advance the epidural catheter back in once it has been removed from the epidural space. The epidural catheter should be removed and placement of a new catheter may be placed.[28,36,38]

Protocol 44.12 Femoral nerve block with the use of a nerve locator

Procedure

1. Place patient in lateral recumbency with the affected leg up (Fig. 44.5).
2. Abduct leg at a 90° angle and extend caudally.
3. Clip and aseptically prepare the area.
4. Attach the nerve locator surface electrode to the patient.
5. Prime the insulated needle delivery system with bupivacaine.
6. Using aseptic technique, palpate the femoral artery. The nerve lies underneath the medial belly of the sartorius muscle and is about 0.5–1.0 cm deep.
7. Using a 40-mm insulated needle, insert the needle cranial to the femoral artery and medial to the sartorius muscle.
8. Once you have entered the skin, place the nerve locator on the uninsulated part of the needle.
9. Turn the nerve locator on and place at a setting of 1–2 mA (2 Hz).
10. The needle should be advanced toward the iliopsoas muscle at a 20–30° angle.
11. Recall that the nerve lies underneath the medial belly of the sartorius muscle and is about 0.5–1.0 cm deep.
12. Once you observe twitches of the quadriceps muscle and extension of the stifle, slowly start to decrease the setting on the nerve locator until you achieve the same desired effect. Your goal is to achieve this desired effect at 0.5 mA. If you are still getting a twitch below 0.5 mA, you increase the risk of an intraneural injection, which is not desirable and may cause neuritis of nerve damage.
13. Aspirate; if no blood is present, inject 0.1 mL/kg of 7.5% bupivacaine. The injection should be smooth and without resistance. If you are having difficulty injecting the drug, the needle may be in the nerve.
14. Slowly withdraw the needle. If you are still obtaining the desired effect on the nerve locator, aspirate; if no blood is present, inject again testing for resistance. If no resistance is appreciated, inject the remainder of the drug.[37]

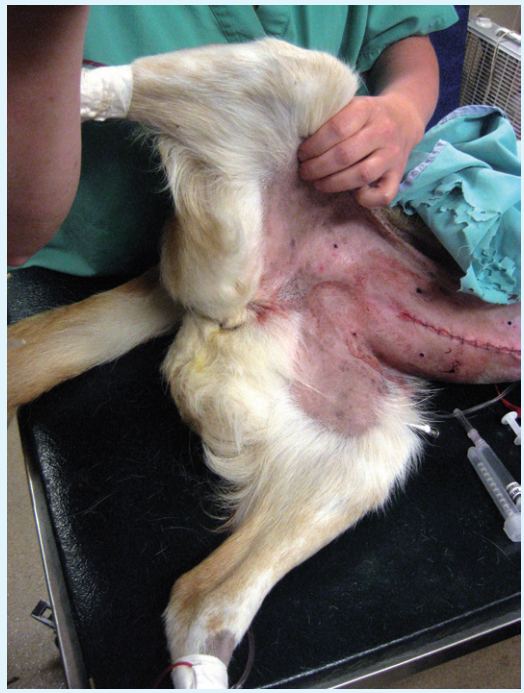

Figure 44.5 Femoral nerve block. Location of femoral nerve block on up leg.

Protocol 44.13 Sciatic nerve block with the use of a nerve locator

Procedure

1. Place the patient in lateral recumbency with the affected leg up.
2. Palpate the ischiatic tuberosity and the greater trochanter of the femur (see Fig. 44.6).
3. Clip and aseptically prepare the site.
4. Attach the nerve locator surface electrode to the patient.
5. Prime the insulated needle delivery system with bupivacaine.
6. Insert a 40-mm insulated needle perpendicular to the skin with an ever so slight angle between the ischiatic tuberosity and the greater trochanter.
7. Attach the nerve locator to the uninsulated part of the needle.
8. Turn the nerve locator on at 1–2 mA (2 Hz).
9. Slowly advance the needle until you get dorsiflexion or plantar flexion of the foot. Once flexion is noted, start to decrease the setting of the nerve locator until you get the same desired effect at 0.5 mA. A positive stimulation <0.5 mA may indicate an intraneural needle placement.
10. Aspirate; if no blood is observed; inject 0.05 mL/kg of 7.5% bupivacaine. There should be no resistance on injection. If you are having difficulty injecting the drug, the needle may be in the nerve. Slowly withdraw the needle. If you are still obtaining the desired effect on the nerve locator, aspirate; if no blood is present, inject again testing for resistance. If no resistance is appreciated, inject the remainder of the drug.[37]

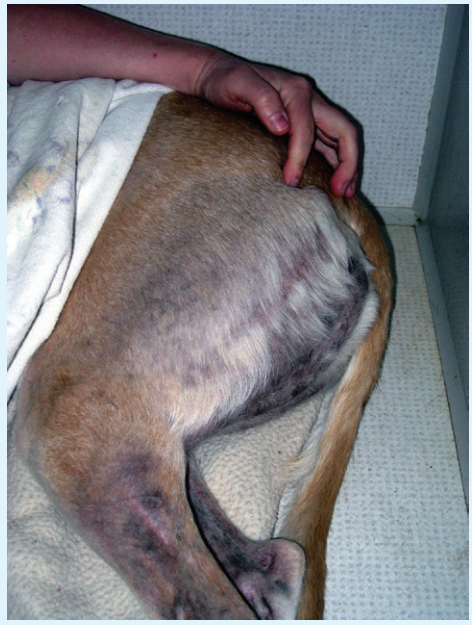

Figure 44.6 Sciatic nerve block. Location of sciatic nerve block on a live dog.

Protocol 44.14 Epidural

Procedure

1. The patient should be placed in either sternal or lateral recumbency depending on the operator's preference. Some people extend the pelvic limbs cranially to possibly increase the size of the epidural space; this is a personal preference.
2. Clip an area at the lumbosacral junction (see Figs. 44.7A and B). Sterile technique is very important in this procedure, so clip an adequate area that allows aseptic technique.
3. Aseptically prepare the skin.
4. After washing hands and while donning sterile gloves, palpate the wings of the ilium with your thumb and middle finger. Using the index finger, palpate the spinous process of the seventh lumbar vertebra.
5. Slide the index finger caudally down the spinous process until the lumbosacral space is palpable. A slight divot can usually be palpated here between L7 and S1.

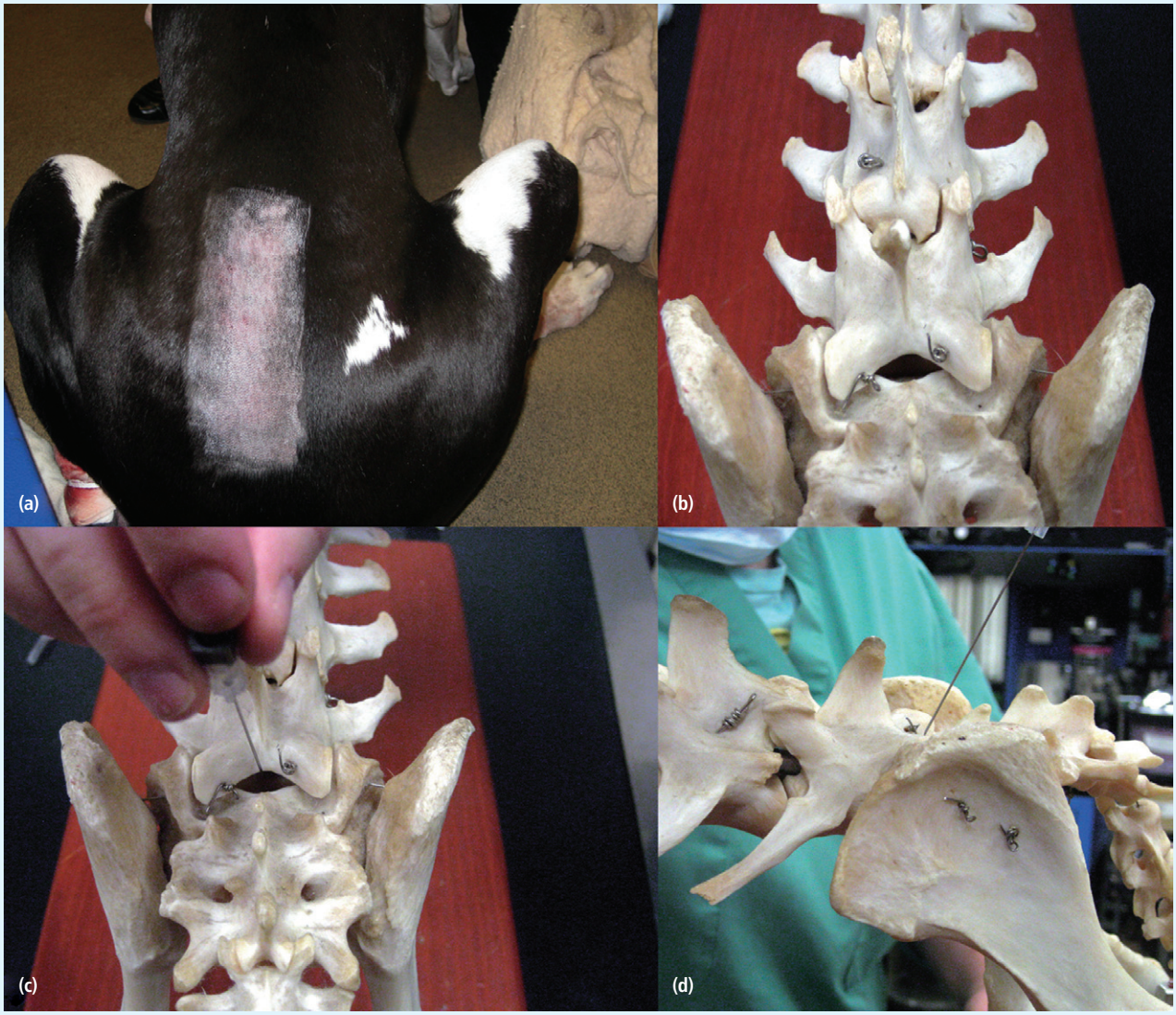

Figure 44.7 Epidural block. (a) Location of an epidural on a live dog. (b) Location of an epidural on a dog skeleton. (c) Location of needle placement on a dog skeleton: dorsal view. (d) Location of needle placement on a dog skeleton: lateral view.

6. Keeping the index finger in place (to maintain positioning), insert a 20- or 22-gauge, 1.5- to 3.0-inch spinal needle (length and size of needle depend on patient size) perpendicular to the skin, ensuring the needle is precisely on midline in 360°.
7. Continue to advance the spinal needle slowly, adjusting the needle angle as needed either cranially or caudally, to ensure proper placement in the epidural space (see Figs. 44.7C and 44.7D).
8. The epidural space sits just ventral to the ligamentum flavum. As the needle is advanced through the ligamentum flavum, usually a "pop" can be felt, although this is not a completely reliable indicator.
9. To ensure correct epidural placement of the needle's tip, remove the stylet, and using a *glass* syringe, which provides little to no resistance, inject a small amount of air (0.25–1.0 mL depending on patient size). While injecting air, there should be no resistance and no back pressure on the plunger of the syringe. If resistance or back pressure on the plunger is appreciated, you are most likely not in the epidural space. Repeat the preceding steps to obtain proper placement.
10. Another method of verifying correct needle placement is by using the "hanging drop" technique. This technique is best performed with the patient in sternal recumbency. Once the needle is placed in the skin, remove the stylet and fill the hub of the needle with saline or local anesthetic. Once you are in the epidural space, the fluid in your needle will drop into the epidural space. This technique is not 100% accurate because tissue plugs can obstruct the needle.

(*Continued*)

11. Once correct needle placement is verified, examine the needle for blood or cerebrospinal fluid (CSF). If none is observed, gently aspirate the needle to reconfirm absence of blood and CSF.
12. Slowly inject the opioid of choice (refer to Table 44.1). It should inject freely with no resistance, similar to an IV injection. If resistance is experienced, you are most likely not in the epidural space and you will need to repeat the preceding process.
13. Follow the opioid with bupivacaine 7.5%, 0.1–0.4 mg/kg; this too should inject with no resistance. If resistance is noted, you are most likely not in the epidural space and will need to repeat the process.
14. Once you have administered the drugs, remove needle, and place the patient with affected side down, allowing the drugs to disperse to the desired location.[38]

Protocol 44.15 Epidural catheter placement

Procedure

1. Epidural catheter kits are available with most if not all the components needed for the placement of the epidural catheter (see Fig. 44.8).
2. The procedure is fairly similar to that of an epidural, but in place of a regular spinal needle, a Tuohy needle is used. The curved tip of the needle allows the catheter to be passed in the appropriate direction (cranially) after needle insertion.
3. Follow the procedure for performing an epidural injection. However, replace the regular spinal needle with a Tuohy spinal needle.
4. Once in the epidural space, remove the stylet and pass the epidural catheter through the Tuohy needle.
5. The tip of the epidural catheter should be placed in close proximity to the painful area. Therefore, premeasuring the catheter prior to placement is important.
6. Remove the Tuohy needle while leaving the catheter in place.
7. Although not an absolute guarantee of correct placement, a radiograph can be performed to verify placement of the epidural catheter. Intended catheter placement is not always achieved because of coiling of the catheter and lateral deviation. The presence of an epidural catheter decreases the likelihood of failure, but it does not guarantee 100% success. If proper placement was not obtained, repeat steps 1–5.
8. It is important to keep the insertion port of the catheter clean and sterile at all times. The insertion site should be covered with a sterile bandage, and aseptic technique should be used when delivering drugs through the insertion port. Reapplication of a sterile bandage should be applied whenever administration of drugs is performed. The insertion site should be inspected daily for inflammation and infection.

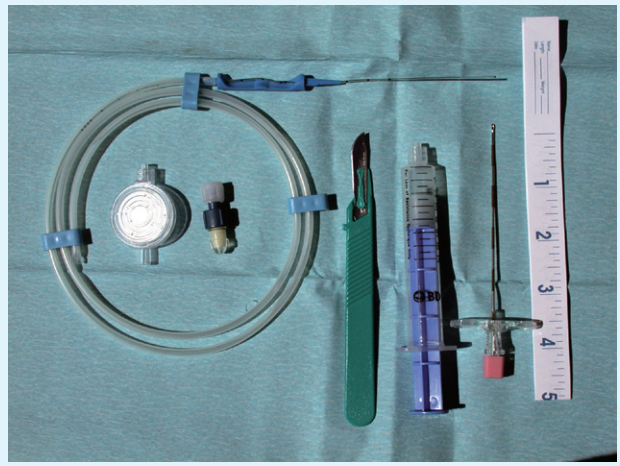

Figure 44.8 Picture of the components of an epidural catheter kit.

Protocol 44.16 Continuous epidural drug infusion[8]

Procedure

1. Dilute preservative-free morphine to 0.5 mg/mL with 0.9% saline.
2. Mix 1 mL of 0.75% bupivicaine with 5 mL of 0.5 mg/mL dilute morphine.
3. Deliver solution at 0.03–0.05 mL/kg/hr.
4. If rear limb paralysis occurs, change concentration of solution to 1 mL of 0.75% bupivicaine in 11 mL of 0.5 mg/mL dilute morphine and deliver at above rate.

Summary

Local analgesia can greatly enhance the overall analgesia in the emergent or critically ill patient. Because local analgesic techniques may aid in decreasing systemic drug requirements, the risk of patient decompensation secondary to sedation, heavy systemic analgesia, or anesthesia is minimized.

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