

Regional Anaesthesia Techniques for Feline Tooth Extractions

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ABSTRACT

Dental diseases are one of the most common diseases in pets, occurring in 80% of old and young cats. Viral diseases, plaque formation, periodontal diseases, tooth and gum problems caused by the disorder of the jaw structure, which are common in cats, make tooth extraction operations compulsory. Regional nerve blocks are used to reduce postoperative pain sensation in the tooth extraction area and to reduce the amount of general anesthetic concentrations used. In this review, regional nerve block techniques in cats will be discussed.

INTRODUCTION

The pain receptors in the dental hard and soft tissues are free nerve endings. A-δ fibers transmit sharp localized pain; A-β fibers conduct touch and pressure; and C fibers provide the sensations of burning, aching, and throbbing. These fibers are stimulated by the *Nervus (N.) maxillaris* and *Nervus mandibularis*, which form the sensory branches of the trigeminal nerves. Therefore, the anatomy of the area where regional anesthesia will be applied should be well known (Rochette, 2005).

Benefits of regional anesthesia methods: reduction in the concentration of inhaled anesthesia, which minimizing complications such as hyperventilation, bradycardia and hypotension. At the same time, preoperative nerve blockages provide analgesia and increase patient comfort and reduce pain sensation, eliminating the need for systemic analgesia (Beckman and Legendre, 2002). There are four nerve blocks that can be applied to animals undergoing tooth extraction.

Infraorbital nerve block

In the maxilla, the *nervus maxillaris* divides into two nerve branches which are *N. pterygopalatinus* and

N. infraorbitalis when it reaches the *Fossa pterygopalatine*: *N. pterygopalatinus* innervate the nasal cavity, soft and hard palate (Rochette, 2005). *N. infraorbitalis* divides into the caudal maxillary alveolar branch before entering the infraorbital canal to innervate the teeth. The caudal maxillary alveolar branch innervates the maxillary first molars, gingiva and oral mucosa. After entering the canal, *N. infraorbitalis* is called the middle maxillary alveolar nerve and innervates the premolar teeth and the associated gingiva. The rostral superior alveolar nerve branches just before exiting the infraorbital canal, innervating the canine, incisor tooth and associated gingiva. *N. infraorbitalis* nerve fibers at the cranial end innervate the upper lip and cutaneous structures (Woodward, 2008; Calvet et al., 2024).

Desensitized area width depends on how far the local anesthetic is injected in the infraorbital canal. A superficial blockade (if left only at the entrance of the infraorbital canal) desensitizes the rostral maxillary teeth, the foramen and surrounding soft tissues, the gingiva, the upper lip, the tip of the nose and the rostral aspect of the tongue. If the anesthetic substance is injected further into the caudal canal, it is sufficient to desensitize the entire maxillary teeth and surrounding soft tissue (Keating, 2016).

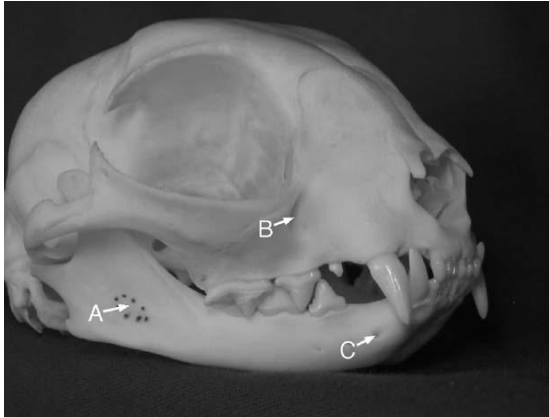


Figure 1. In the cat skull, the arrow next to A indicates the location of the foramen mandibulare. The arrow next to B indicates the location of the foramen infraorbitale. The arrow next to C indicates the location of the foramen mentale (Rochette, 2005)

To locate the foramen infraorbitale, the upper lip is lifted upward and an imaginary line is drawn downward from the medial canthus of the eye. It is located about 1 cm above the 3rd premolar tooth in dogs and about half cm above the 2nd premolar tooth in cats (Figure 1), (Keating, 2016.). In dogs, the location of the foramen can be felt by palpation, however in cats palpation of the foramen is quite difficult. Therefore, it is more likely to inject the local anesthetic into the skin or upper lip instead of the infraorbital canal. After locating the foramen, the needle to be used is advanced into the infraorbital canal at a 45 degree angle, (Figure 2). When administering local anesthetics, the entire needle is not inserted into the canal, because the orbit and infraorbital canal are in participation. Especially in brachiocephalic breeds, the canal is short and can cause neurological damage and bleeding (De Vries and Putter, 2015).

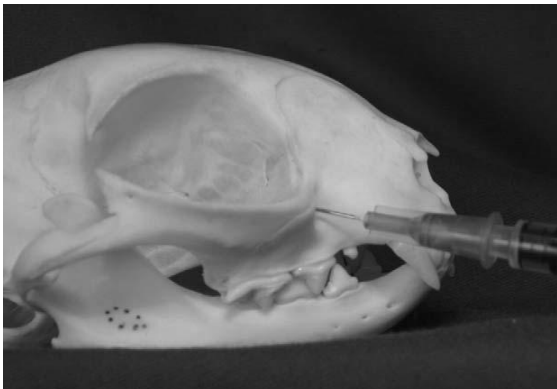


Figure 2. Positioning of the injector in the infraorbital canal (Rochette, 2005)

The needle is inserted into the infraorbital canal, aspiration is performed, it is checked whether it is in the vein. If not in the vein, the drug is injected slowly and steadily (Beckman, 2013). In cats, the infraorbital canal is very short (3-4 mm) and excessive needle advancement may cause ocular damage. This method can be used for canine incisors and premolars, but if we want to desensitize molars, it is more advantageous to use the maxillary nerve block technique. Excessive mouth opening should also be avoided in cats as it can compromise blood flow through

the maxillary artery, in which there is no collateral circulation to the cerebrum and retina and can may lead to irreversible damage. Mouth gags with a maximum length of 20-30 mm should be used for cats (Grubb and Lobprise, 2020).

Maxillary nerve block

In the intervention applied to the maxillary nerve block, all premolar and molar teeth, hard and soft palates, tongue, tip of the nose, upper lip and bone and other soft tissues of the maxilla are affected. There are two types of approaches to access the maxillary nerve block and this varies depending on the animal species and size: percutaneous and intraoral approaches (Beckman, 2013).

Extraoral approach

With the patient's mouth open, an imaginary perpendicular line is drawn from the medial canthus of the eye to the arc. zygomaticus. The needle is advanced in the pterygopalatine fossa until it hits the bone tissue and the foramen maxilla is reached (Dugdale, 2010). After checking whether the tip of the injector is in the vein, the drug is injected (Figure 3), (Grubb and Lobprise, 2020). This method has been used successfully in large breed and medium-sized dogs, but in cats it would be more appropriate to use the oral approach because the foramen maxilla and bulbus oculi are narrow and distance between them is close (Keating, 2016).

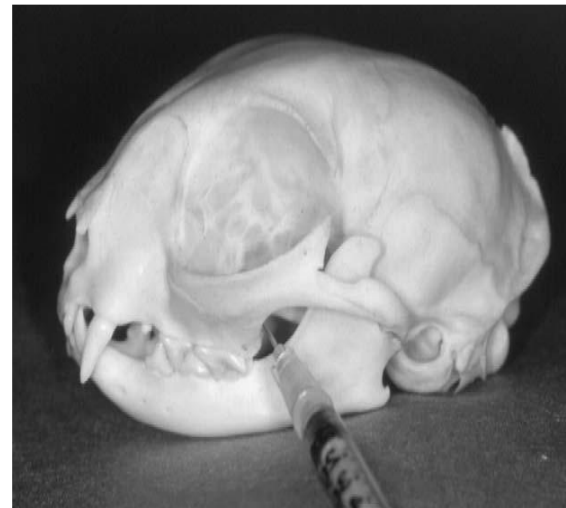


Figure 3. Extraoral approach technique to the foramen maxilla in the cat (Rochette, 2005)

Intraoral approach

The patient's mouth is opened and the lips are pulled back caudally. The needle is positioned perpendicular to the end of the maxillary 2nd molar root and It is slowly advanced 2-4 mm. After checking whether the tip of the injector is in the vein, the drug is injected (Perry et al., 2015).

Mental nerve block

The nervus mandibularis enters the mandible through the foramen mandibulare and travels in the canalis mandibulare (Rochette, 2005). It is called *N. inferior alveolaris* to innervate premolar and molar teeth in the mandibular canal. *N. inferior alveolaris* takes the name of n. mentale after leaving the foramen mentale and affects the canine and incisive teeth, gingiva and lower lip (Dursun, 2008).

The area of local anaesthesia is related to how far the drug is given caudally in the foramen mentale. A superficial blockage affects only the soft tissue in the canine rostral midline, while a deep blockage affects the canine, incisor and soft tissue (Keating, 2016). But in the cats, it affects canine, incisive, premolars and sometimes molars along with soft tissue. However, correct blocking in cats is not as easy as in dogs. Both the location of the foramen and the width of the foramen may prevent the correct spread of anesthesia (Beckman, 2013). The foramen mentale can be palpated ventrally at the level of the 2nd premolar in the dog. Since the cat does not have a 2nd premolar, it is located exactly in the middle, equidistant from the canine teeth and 3rd premolars (Figure 1). During blockade, the lower lip is pulled downwards, the needle is positioned slightly outwardly at the designated point and gently advanced 1-3 mm (Rochette, 2005).

If the needle hits a wall to the right and left, but moves smoothly along the caudal pathway, the foramen has been reached. Aspiration is performed, the drug is injected slowly after checking whether it is in the vein. If there is no swelling of the lip or gingiva due to leakage, we have a second confirmation that we are in the foramen (Beckman, 2013).

Inferior alveolar nerve block

Inferior alveolar nerve blockage affects all canine, incisive, premolar and molar teeth, tongue, lower lip, bone tissue and soft tissues, in short, the entire mandible (Beckman, 2013). The foramen mandibulare is between the 3rd molar tooth medial to the ramus mandibulare in the dog and the angular fold of the mandible. In the cat, it is between the 1st molar tooth and the angular fold of the mandible (Figure 1), (Snyder L et al., 2019). The foramen mandibulare can be difficult to palpate in medium breed dogs and cats. However, palpation of the foramen is not necessary and the approximate site for injection can be determined using known locations (Goudie-DeAngelis et al., 2016). There are two types of approach to the foramen mandibulare: extraoral approach and intraoral approach.

Extraoral approach

An imaginary line is drawn from the ventral border of the ramus mandibularis and the lateral canthus of the eye. The finger inserted into the mouth is placed at the base of the molar root. The point where the needle will enter is limited. The needle is placed perpendicular to the ramus mandibulare and the drug is injected through the skin under the guidance of the finger (Grubb and Lobprise, 2020).

Intraoral approach

The patient's mouth is opened, the needle is placed between the distal face of the molar and the mandibular salivary gland. It is advanced 2-3 mm at an angle of 45° towards the angular direction of the ramus mandibulare. When the bone tissue of the ramus mandibulare is felt, the plunger of the syringe is controlled and the drug is injected (De Vries and Putter, 2015).

Both methods have complications that can occur as a result of the procedure. Incorrect positioning of the syringe may cause trauma to the tongue, excessive drug volume may affect the n. lingualis (Grubb and Lobprise, 2020).

As a result, regional anesthesia can provide a more comfortable procedure for our patients and a more satisfying experience for our clients. Nerve blocks stop the

pain stimulus before it occurs. The most commonly used blocks for oral and dental surgery are infraorbital, maxillary, mental and mandibular blocks. Regional anesthesia reduces the need for general anesthesia, provides relief of intraoperative and postoperative pain, and contributes to a smoother postoperative recovery. These benefits increase customer satisfaction by making the patient's postoperative recovery more comfortable and ensuring that the patient is discharged with less drug residue.

Conflict of Interest

The authors declare that they have no competing interests.

Authorship contributions

Concept: B.K., Design: B.K., Data Collection or Processing: B.K., Z.D.Ü., Literature Search: B.K., Z.D.Ü., Writing: B.K., Z.D.Ü.

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