New injectable anesthesia and pain management in dogs and cats

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What are commonly used medetomidine combinations in generally healthy dogs?

Medetomidine 15-30 μg/kg and ketamine 1.5-3 mg/kg, IV (low dose) or IM (high dose) provide excellent muscle relaxation, immobilization for 60-90 min and mild to moderate of analgesia for 30-40 min.

Medetomidine 15-30 μg/kg and butorphanol 0.2 mg/kg, IV or IM provides excellent muscle relaxation and immobilization for 60-90 min and mild to moderate analgesia for 30-40 min. These two combinations are the most commonly used injectable combination for radiography (OFA, PENN hip) and orthopedic exams in dogs in the USA.

What are the differences between medetomidine-ketamine and medetomidine-butorphanol combination?

The main difference is heart rate. Heart rate tends to be higher in dogs (60-90 beats per min vs 35-55 beats per min) that receive the medetomidine-ketamine combination. This is mainly due to the catecholamine stimulatory effect of ketamine on the heart.

The second difference is timing for reversal. Dogs that receive medetomidine-butorphanol can be reversed with atipamezole at any given time, while dogs that receive medetomidine-ketamine should not be reversed with atipamezole until at least 40 min after ketamine administration to prevent a rough recovery. This is because ketamine is mainly metabolized by the liver in dogs, and it takes time. When medetomidine is reversed with atipamezole, the medetomidine-induced muscle relaxation effect is also antagonized. Consequently, the ketamine-induced muscle rigidity and other dissociative signs (head shaking, salivation, vocalization and sometimes defecation) may

become dominant, resulting in a rough recovery.

What are common medetomidine combinations for use in generally healthy cats?

Medetomidine 60-80 ㎍/kg with ketamine 5 mg/kg and butorphanol 0.2 mg/kg can be combined in same syringe for a single IM injection. This combination induces general anesthesia, excellent muscle relaxation and profound analgesia that is suitable for declaw, castration or OHE. The onset of anesthesia is rapid. The cat assumes in lateral recumbency and allows endotracheal intubation within 5 min of IM injection. At the end of procedure, the cat can be reversed atipamezole (same volume as the medetomidine dose) and recovery is achieved in 5-8 min. Residual analgesia is still present due to butorphanol and ketamine. If the cat is not reversed with atipamezole, a complete recovery may take up to three hours. During this recovery period, the cat should be monitored and precaution should be taken to prevent hypothermia.

Are there other medetomidine combinations for use in dogs and cats?

Yes, several combinations including DZ and DZT are recently developed combinations that can be used in dogs and cats from premedication to injectable anesthesia.

Last year, I developed and introduced the use of medetomidine (Domitor) with tiletamine-zolazepam (Zoletil-50) and named this combination as DZ.

This combination is similar to a well known medetomidine combination in the US, called TTD (Telazol-Torbugesic-Domitor), which essentially contains identical ingredients of medetomidine and tiletamine-zolazepam in the combination. However, in the US, the use of butorphanol is very common and it is part of this TTD combination. In Korea, the use of butorphanol remains to be explored. Therefore the DZ combination was developed with the use of butorphanol.

DZ combination

DZ combination is formed by adding 5 mL of Domitor into powder of Zoletil 50. The end result is 5 mL of DZ combination. Each mL of DZ contains 1000 ㎍ of medetomidine and 50 mg of Zoletil.

To use DZ combination for dogs and cats

For premedication purpose

0.01mL/kg, IM to induce mild to moderate sedation

For immobilization, radiographic and minor surgical procedures (laceration repair)
0.02–0.03 mL/kg, IM or IV (less volume)

For injectable anesthesia of 40–50 minutes
0.04–0.05 mL/kg, IM or IV (less volume)

Reversal of DZ can be achieved with atipamezole (Antisedan) at the same volume as DZ and administer IM to the dog or cat. The signs of recovery should appear within 5–8 minutes after IM injection.

DZT combination

Tramadol possess unique property for pain management. Tramadol has opioid like activity, but it is not exactly the same as opioid. It can be used to treat mild to moderate pain. Injectable tramadol is not a controlled substance and can be used to combine DZ combination mentioned earlier and formed so called the DZT combination.

DZT combination is formed by adding 2 mL of Domitor and 3 mL of tramadol (50 mg/mL) into powder of Zoletil 50. The end result is 5 mL of DZT combination. Each mL of DZ contains 400 μg of medetomidine, 50 mg of Zoletil and 30 mg of tramadol.

To use DZ combination for dogs and cats

For premedication purpose
0.01–0.02 mL/kg, IM to induce mild to moderate sedation

For immobilization, radiographic and minor surgical procedures (laceration repair)
0.03–0.04 mL/kg, IM or IV

For injectable anesthesia of 40–50 minutes
0.05–0.06 mL/kg, IM or IV

Reversal of DZT can be achieved with atipamezole (Antisedan) at $\frac{1}{2}$ volume as DZT and administer IM to the dog or cat. The signs of recovery should appear within 5–8 minutes after IM injection.

Should I use atropine to prevent or treat bradycardia induce by medetomidine in dogs and cats?

Atropine should not be used to prevent or treat bradycardia induced by medetomidine in dogs and cats. Cats are less sensitive to medetomidine induced bradycardia and bradycardia is very uncommon in cats. Therefore, it is not necessary to prevent or treat bradycardia in cats.

In dogs, medetomidine inducing peripheral vasoconstriction and resulting in reflex bradycardia more so than that in cats. Administering atropine in dogs significantly increases in heart rate, especially given at higher doses (0.05 mg/kg) and administer intravenously (IV). The significant increased in heart rate in the presence of peripheral vasoconstriction resulting in significant systemic hypertension, pulmonary hypertension, and cardiac arrhythmias. This is dangerous and unphysiological to dogs with atropine-medetomidine combination.

I have heard occasionally dogs and cats receiving atropine and medetomidine combination developed pulmonary edema/hemorrhaging , why ? How do I prevent this from happening?

In the US, Japan, Australia and New Zealand very rarely this type of cases were seen when medetomidine is used alone or in combination. In these countries, the use of atropine with medetomidine is strongly discouraged. In Korea, it seems to be relatively common to combine atropine with medetomidine or medetomidine combinations. This could result in the observed acute pulmonary edema and hemorrhaging in dogs and cats.

The main cause of this problem is due to excessive pulmonary hypertension in these dogs and cats following 1) high doses of atropine (0.05 mg/kg) and 2) administering intravenously with atropine.

Other factors that exacerbate pulmonary hypertension are :

1) Heart worm diseases
2) Hypoxia
3) Hypercapnia
4) Obstructing airway (neck bend during the surgery)
5) Postsurgical pain

All these factors can act to worsen the atropine-medetomidine treated dogs or cats and resulting in unfavorable outcome of acute pulmonary problems.

To prevent these problems, first do not use atropine with medetomidine. Second to provide 100% oxygen in the anesthetize dogs and cats. Finally, providing pain management during postoperative period.

How do I use injectable carprofen (Rimadyl) in dogs and cats?

Injectable carprofen provides a convenient way for preemptive analgesia in dogs and cats before surgery. It can be administered at a rate of 4.4 mg/kg, SC prior to surgery but soon after anesthesia induction. Some practitioners prefer to administer carprofen as part of premedication before anesthesia induction.
Studies have shown that preemptive carprofen provides the best outcome for analgesia and anti-inflammatory actions.

Alternatively, carprofen can be given postoperatively as soon as the surgical procedure is finished. One injection of carprofen at the dose of 4.4 mg/kg, SC can provide duration of analgesia up to 24 hours. This can be followed up with oral carprofen tablets for next several days in dogs.

For cats, one dose of caprofen is adequate since cats takes a longer time to metabolize carprofen than that in dogs.

Caprofen can also be combined with tramadol as a take home or in-hospital pain management.

Detail discussion will be covered during the presentation.

How much propofol will be spared if a micro-dose of medetomidine is given just prior to propofol induction in dogs?

Using an identical setting, dogs received 1 μg/kg of medetomidine 45 seconds prior to propofol induction, and the induction dose of propofol was similar to that of high dose (0.4 mg/kg) diazepam. The duration of intubation (12 min) and lateral recumbency (14 min) were longer than either high or low doses of diazepam plus propofol. The dogs completely recovered in 16 min. So, a micro-dose of medetomidine provides a longer duration of action than diazepam when given 45 seconds prior to propofol induction.