

**An anesthetic update including the use of Alfaxan®**

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theVSCAN™ OTTAWA-CARLETON VETERINARY PROFESSIONALS EMERGENCY & CRITICAL CARE

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## The Plan

### ALFAXALONE

- Intravenous use for induction of general anesthesia
- Intramuscular use for sedation in cats and dogs
- Literature review

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## Alfaxalone vs Propofol

SIMILARITIES	DIFFERENCES
<ul style="list-style-type: none"> <li>Act on same receptors</li> <li>Excellent muscle relaxation</li> <li>Quick onset and duration</li> <li>No analgesia</li> <li>Dose-dependent cardiovascular depression</li> <li>Dose-dependent respiratory depression</li> </ul>	<ul style="list-style-type: none"> <li>Dose</li> <li>Color</li> <li>Volume of injection</li> <li>Can be given IM</li> <li>Suitability for CRI in cats</li> <li>Margin of safety</li> </ul>

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## Alfaxalone vs Ketamine



### DIFFERENCES

- Dose
- Volume of injection
- **Mechanism of action**
- Duration of action
- **Muscle relaxation**
- Provision of analgesia
- Respiratory effects
- **Cardiovascular effects**
- **Assessment of the anesthetic plan**
- Use of CRI for different purposes

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## How I Administer Alfaxalone IV?

### INTRAVENOUS USE

- Premedication on-board
  - Opioid
  - Opioid+acepromazine +/- benzodiazepine
  - Opiod+dexmedetomidine +/- benzodiazepine
- Drawn-up the entire dose 2 mg/kg
  - Can vary pending on the premedication effect

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## How I Administer Alfaxalone IV?

- Pre-oxygenation/facemask during induction
- Give 0.5 mg/kg ( $\frac{1}{4}$  of the dose) every 15 seconds until jaw tone is loose and I can intubate without evoking cough
- Always vigilant on respiration and heart rate changes



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## Alfaxalone and Benzodiazepine IV

When to associate with benzodiazepine:

- Geriatric patients
- Patients with cardiac disease
- Patients with multiple co-morbidities




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## Alfaxalone and Benzodiazepine IV

Alfaxalone 0.25 mg/kg followed by midazolam 0.3 mg/kg



- 62% ↓ alfaxalone dose ( $1 \pm 0.4$  mg/kg vs  $0.4 \pm 0.2$  mg/kg)
- ↑ time from intubation to spontaneous movement when midazolam given

Munoz K et al, 2017 (in press)  
Vet Anaest Analg

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## How I Administer Alfaxalone with Benzodiazepine IV?

Administer  $\frac{1}{4}$  of the dose of alfaxalone



Administer the entire dose of benzodiazepine  
(0.2 mg/kg midazolam/diazepam)



Administer more alfaxalone if necessary

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## "Baxter"

- 12 yo, MN, Labrador Retriever Mix
- T12-L2 hemilaminectomy and corpectomy T13-L1
- Blood work results WNL
- Temperament: anxious



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## "Baxter"

- Trazodone 125 mg PO (5 mg/kg) at arrival

### PREMEDICATION:

- Acepromazine 0.005 mg/kg IV
- Hydromorphone 0.05 mg/kg IV

### INDUCTION:

- Alfaxalone 0.4 mg/kg IV
- Midazolam 0.2 mg/kg IV

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## Pre-induction



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## Alfaxalone in Pediatric Dogs

*"Clinical evaluation of alfaxalone as an anaesthetic induction agent in dogs less than 12 weeks of age"*

- 25 dogs aged < 12 weeks
- Surgical procedure: spay or neuter



O'Hagan et al, 2012  
*Aust Vet J*

## Alfaxalone in Pediatric Dogs

- Mean induction dose:  $1.7 \pm 0.3$  mg/kg
- Post-induction apnea: 1 dog
- HR did not change significantly from pre-induction values
- The majority of the recovery was evaluated as good-excellent

O'Hagan et al, 2012  
*Aust Vet J*



## Puppy "George"



- 7 weeks old, M, Bull Mastiff, 5.2 kg
- Presenting complaint: seizures
- Blood work: wnl except decreased hematocrit (25%)

## Anesthetic Considerations for a Neonate

- Increased permeability BBB
- Cardiac output is HR dependent
- Limited myocardial contractile tissue and low ventricular compliance
- Poor vasomotor control
- Immature renal and hepatic function (up to 8-12 weeks)

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“George”

- Premedication:
  - butorphanol 0.2 mg/kg IV
  - midazolam 0.1 mg/kg IV
- Induction:
  - alfaxalone 1.7 mg/kg



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“George”



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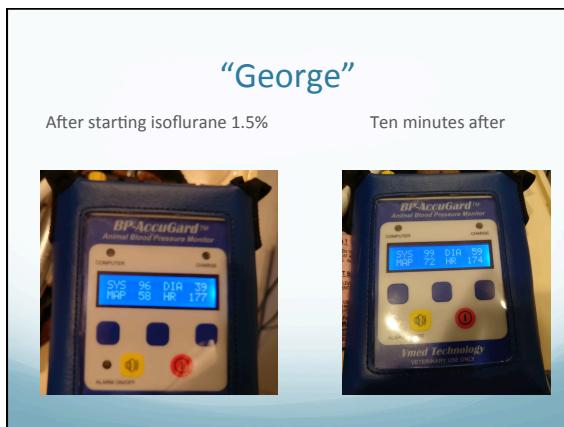
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**Alfaxalone for Cesarean Section**

- 22 dogs receiving either alfaxalone 1-2 mg/kg or 4-6 mg/kg propofol
- Apgar score at 5,15 and 60 minutes post-delivery
- Puppy survival at 3 months was similar
- Increased Apgar scores in the alfaxalone group from 5 to 60 minutes

↓

Doebeli et al, 2013  
*Theriogenology*

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**“Jewel”**



Problems:

- acute onset of seizures
- mild azotemia (CKD)
- progressive weight loss
- 4.2 cm cyst right-side mediastinum
- mild pleural effusion

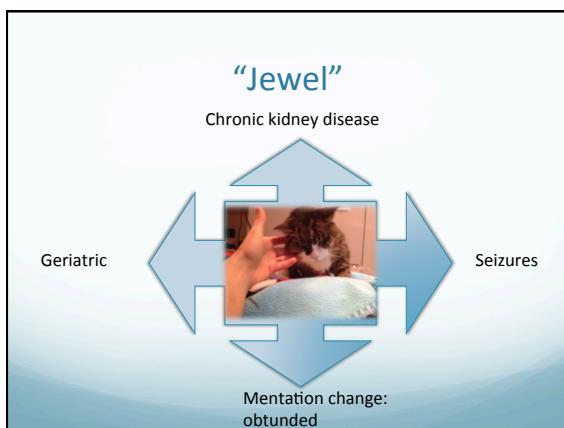
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**“Jewel” Anesthetic Plan**

- No premedication
- Pre-oxygenation
- Induction: alfaxalone 1.5 mg/kg IV and midazolam 0.1 mg/kg
- Maintenance: isoflurane 1-1.5%
- Fluidotherapy: Plasmalyte-A 5 ml/kg/hr

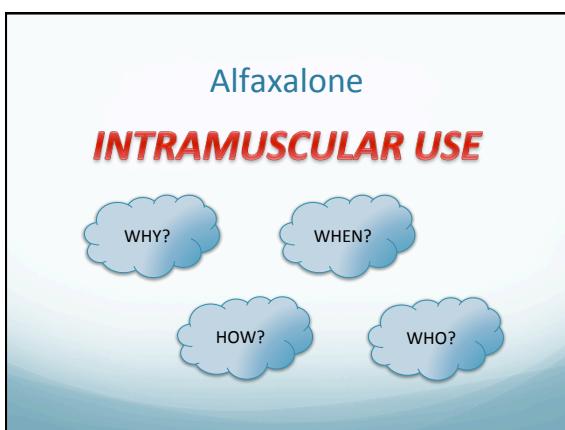
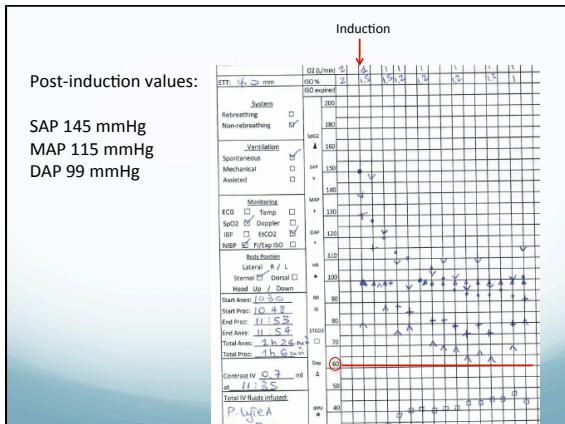
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### Intramuscular Use – Why?

- Quick onset
- Short duration
- Minimal/none respiratory and cardiovascular effects (dose-dependent)
- Makes the patient cooperative without excessive sedation (depending on the dose and the other drugs combined)

### Intramuscular Use – Who?

- Cats and small size dogs (and rabbits, chinchillas, pigs,...)
- Stressed/uncooperative patients
- Geriatric
- Cardiac disease (valve disease, HCM, unknown?!)
- Respiratory disease
- Hyperthyroid cats
- Brachycephalics

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### Intramuscular Use – When?

- Obtain vascular access
- Perform non-invasive procedures
  - Blood collection
  - Radiographs
  - Cardiac or abdominal ultrasound
  - CT-scan
- Injectable anesthesia for short surgical procedure

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### Intramuscular Use – How?

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## How I Use Alfaxalone IM?

- Use ALWAYS in combination with other sedatives/ tranquilizers
- High volume of injection for animals > 10-15 kg
- Dose: 1-2 mg/kg
- Monitoring and oxygen supplementation (pending on degree of sedation)

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## How I Use Alfaxalone IM?

Combinations I use:

### Alfaxalone 1-2 mg/kg

- + midazolam 0.1-0.2 mg/kg
- + midazolam 0.1-0.2 mg/kg + butorphanol 0.2 mg/kg
- + acepromazine 0.01 mg/kg + butorphanol 0.2 mg/kg

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### Sedative effects of intramuscular alfaxalone administered to cats



- IM Alfaxalone at different doses:
  - 1 mg/kg
  - 2.5 mg/kg
  - 5 mg/kg
  - 10 mg/kg
- Dose-dependent sedative effect
- More side effects at high doses: hypotension, opisthotonus-like posture, paddling, tremors

Tamura J et al, 2015  
J Vet Med Sci

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**Comparison of intramuscular alfaxalone and ketamine combined with dexmedetomidine and butorphanol for castration in cats**



Dexmedetomidine 10 mcg/kg + butorphanol 0.2 mg/kg

Alfaxalone 3 mg/kg      Ketamine 5 mg/kg

- CV variables: no differences
- Alfaxalone group better quality of recovery
- > willing to walk 30 min after extubation
- < ataxic 2 hrs after extubation

Khenissi L et al, 2016  
*J Fel Med Surg*

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**Intramuscular injection of alfaxalone in combination with butorphanol for sedation in cats**



Alfaxalone 2 or 5 mg/kg + butorphanol 0.2 mg/kg

- Alfaxalone 5 mg/kg
  - Better quality sedation
  - Longer time to sternal and standing
- No differences in cardiorespiratory variables

Deutsch J et al, 2017  
*Vet Anaesth Analg*

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**“Mickey”**



- 15 yo, DSH, FS
- Presenting complaint: dyspnea
- Sedation needed
  - place the IV catheter
  - obtain chest radiographs
  - blood draw for CBC/biochemistry

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## Ideal Premedication Drugs

- ✓ Minimal respiratory depression
- ✓ Minimal cardiovascular effects / no effects
- ✓ Short duration of action
- ✓ Not excessive CNS depression (no "flat" cat)

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## Drugs Choice

- Dexmedetomidine
- Acepromazine
- Midazolam
- Opioids (butorphanol, hydromorphone, meperidine, buprenorphine)
  - Butorphanol

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## Drugs Choice

Alfaxalone 1 mg/kg + midazolam 0.2 mg/kg IM



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**“Rocky”**

- 17 yo DSH, MN
- Presenting complaint: unable to move his tail, lumbar pain
- Systolic heart murmur III-IV/VI (mild HCM)
- Chronic kidney disease with mild azotemia

**“Rocky”**

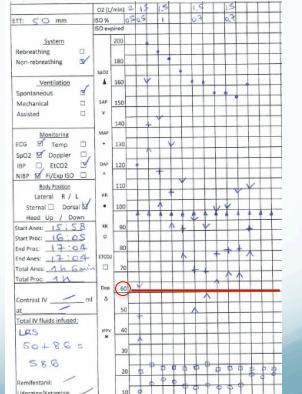
Alfaxalone 1 mg/kg + butorphanol 0.2 mg/kg + midazolam 0.1 mg/kg

## Pre-induction values:

- HR:135-140 bpm
- MAP: 60 mmHg

## Hypotension post-induction

Ephedrine 0.1 mg/kg IV with improvement



### “Rocky”

Premedication with butorphanol 0.1 mg/kg IV

Recovery after induction with alfaxalone for 15 minutes procedure

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### “Mya”

- 6 yo, Persian, FS, 2.9 kg
- Presenting complaint: corneal sequestrum
- Surgical procedure: keratectomy and conjunctival graft
- Otherwise healthy cat

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### “Mya”

Alfaxalone 1 mg/kg + hydromorphone 0.05 mg/kg +  
dexmedetomidine 1 mcg/kg IM



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## Alfaxalone IM for Injectable Anesthesia

Medetomidine 20 mcg/kg + butorphanol 0.2 mg/kg + alfaxalone 3 mg/kg

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## Alfaxalone IM for Injectable Anesthesia

Quick onset of action



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## Alfaxalone IM for Injectable Anesthesia

Smooth induction and intubation



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### Alfaxalone IM for Injectable Anesthesia

Cardiorespiratory parameters

The image displays two side-by-side veterinary monitoring screens. The left screen shows a digital display with the number '89' and a waveform. Below it, a smaller screen displays 'Microstream' with a waveform and numerical values. The right screen shows a larger waveform, a digital display with the number '112', and various numerical parameters including heart rate, oxygen saturation, and blood pressure.

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### Alfaxalone IM for Injectable Anesthesia

Ventilation

The image displays two side-by-side veterinary monitoring screens. Both screens show waveforms and digital displays with the numbers '112' and '108'. Various numerical parameters are visible on both screens, including heart rate, oxygen saturation, and blood pressure.

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### Alfaxalone IM for Injectable Anesthesia

Recovery 20 minutes after initial injection

A white cat is lying on its back on a dark-colored recovery table. A person's hand is visible, holding a monitoring probe near the cat's head. The cat appears to be in a state of recovery, with its eyes partially open and its body relaxed.

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## Alfaxalone IM for Injectable Anesthesia

Advantages compared to ketamine:

- Less stress on the cardiovascular system
- No “dissociate state” if alpha2 is antagonized too early
- Association with hydromorphone with less side effects (hyperthermia)

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## Alfaxalone IM for Injectable Anesthesia

Disadvantages compared to ketamine:

- Volume of injection
- Cost
- Lack of analgesia (significance?!)

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## Alfaxalone IM in Dogs

*“Cardiorespiratory and anesthetic effects produced by the combination of butorphanol, medetomidine and alfaxalone administered intramuscularly in Beagle dogs”*

- Medetomidine 10 mcg/kg + butorphanol 0.1 mg/kg and alfaxalone 1.5 mg/kg
- Could be intubated
- Duration about 80-90 min

Lee J et al, 2015  
Surg

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## Alfaxalone IM in Dogs

*"The pharmacological effects of intramuscular administration of alfaxalone combined with medetomidine and butorphanol in dogs"*

- Medetomidine 2.5 mcg/kg + butorphanol 0.25 mg/kg and alfaxalone 2.5 mg/kg
- Could be intubated
- Duration about 40-80 min
- Alfaxalone 2.5 mg/kg alone: lateral recumbency for 40-50 min

Tamura J et al, 2016  
Surg

## “Isidore”



- Boston Terrier, 11 yo, NM, 7.1 kg
- History of 2 years seizures due to neoplasia (suspected glioma)
- Left-side heart murmur III/VI (unknown origin)
- Present complaints: ataxia, back pain and urinary incontinence
- Procedure: thoracic radiographs and T3-LS spine MRI

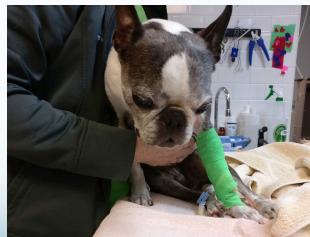
## “Isidore”



- Geriatric
- Brachycephalic
- History of suspected brain tumor
- Heart murmur unknown origin
- Back pain

### “Isidore”

Alfaxalone 1 mg/kg + meperidine 3 mg/kg + midazolam 0.2 mg/kg IM



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### “Isidore”

Alfaxalone 1 mg/kg + meperidine 3 mg/kg + midazolam 0.2 mg/kg IM



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### “Pearl”

- Pug, 2 yo, FS, 8 kg
- Present complaint: generalized seizure
- Difficulty breathing and abdominal effort
- Procedure: thoracic radiographs and brain MRI



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“Pearl”



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“Pearl”

Alfaxalone 1 mg/kg and butorphanol 0.2 mg/kg IM



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“Benito”

- Chihuahua, 3 yo, MN, 3.5 kg
- Presenting complaints: intermittent episodes of screaming and suspected seizures
- Procedure: brain and cervical spine MRI

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