Perioperative comfort in cats

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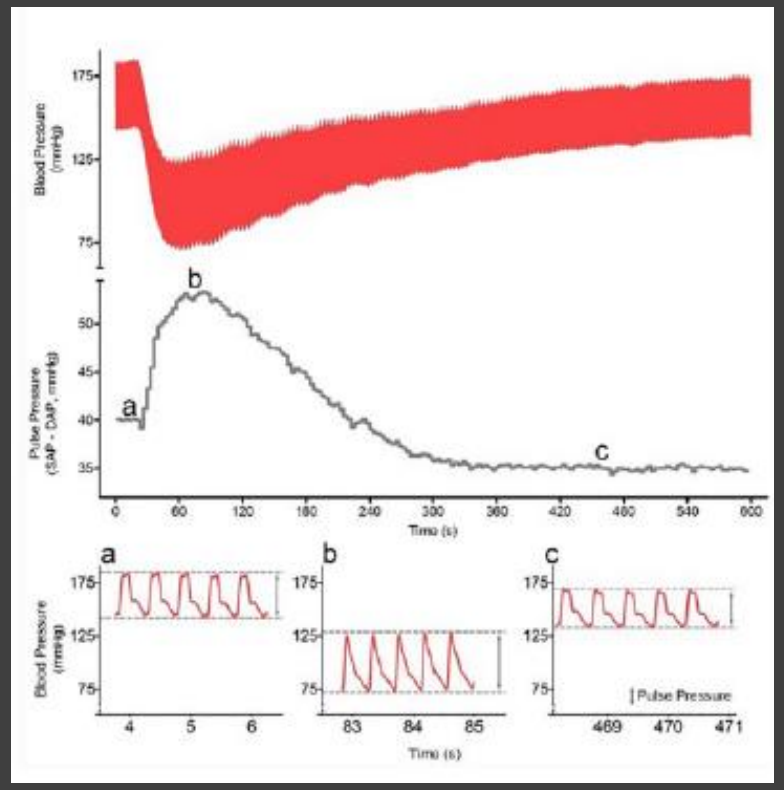
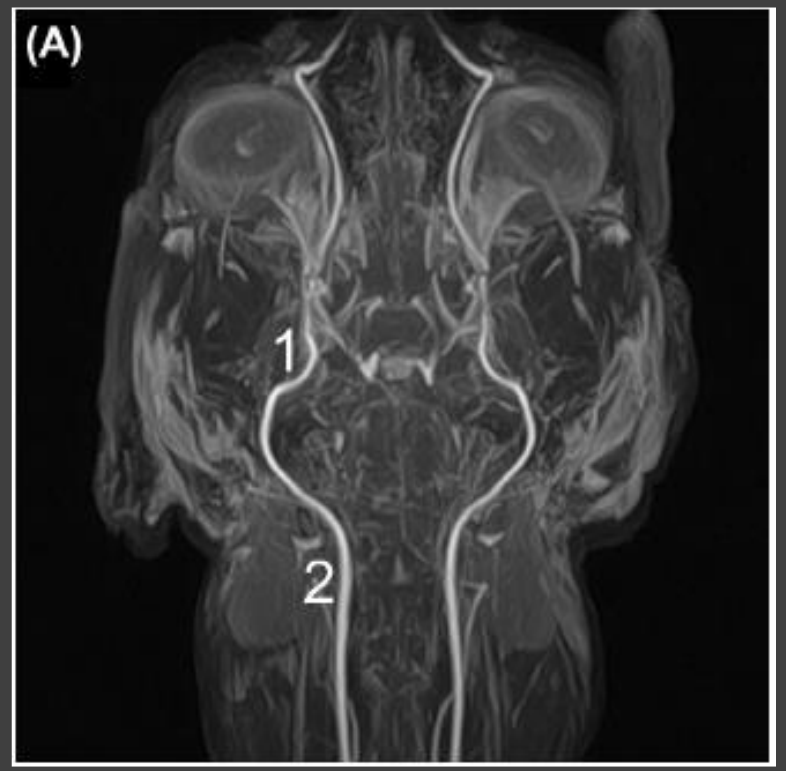
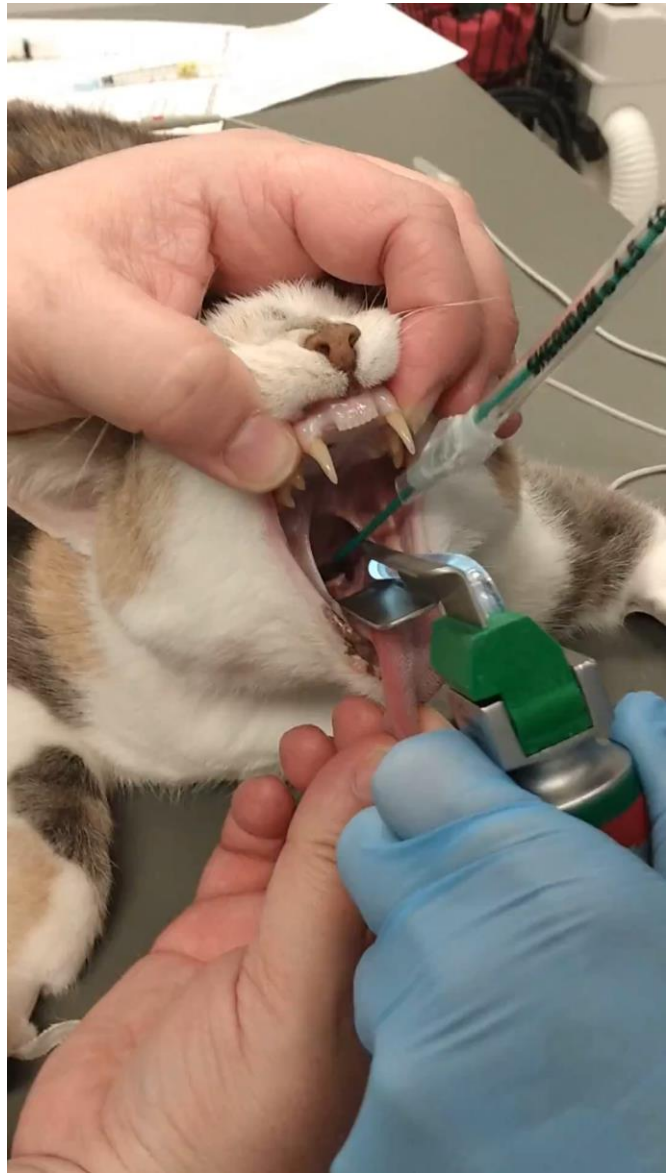
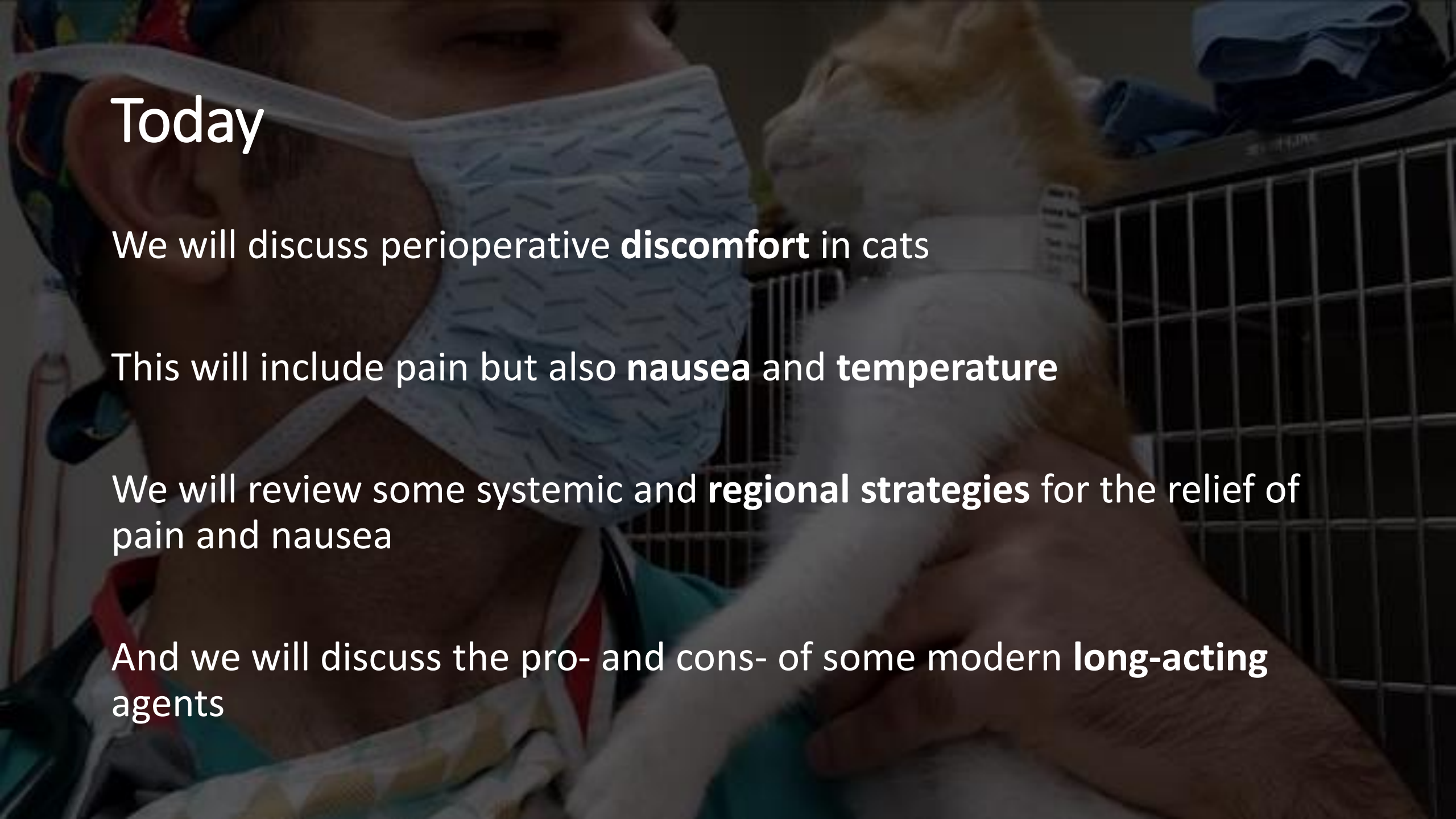




Some of my interests in cats





Today

We will discuss perioperative **discomfort** in cats

This will include pain but also **nausea** and **temperature**

We will review some systemic and **regional strategies** for the relief of pain and nausea

And we will discuss the pro- and cons- of some modern **long-acting** agents

Pain assessment in cats

Not an easy task

3 domains to assess:

- Sensory (location, intensity and duration of pain)
- Emotional or affective (some behavioral changes)
- Cognitive (related to prior experience or knowledge)

Scales help us assess some of these aspects methodically to reduce bias and errors

Definitive Glasgow acute pain scale for cats: validation and intervention level

J. Reid, E. M. Scott, G. Calvo, A. M. Nolan

Glasgow Feline Composite Measure Pain Scale: CMPS-Feline

Choose the most appropriate expression from each section and total the scores to calculate the pain score for the cat. If more than one expression applies choose the higher score

LOOK AT THE CAT IN ITS CAGE:

Is it?

Question 1

Silent / purring / meowing	0
Crying / growling / groaning	1

Question 2

Relaxed	0
Licking lips	1
Restless/cowering at back of cage	2
Tense/crouched	3
Rigid/hunched	4

Question 3

Ignoring any wound or painful area	0
Attention to wound	1

Question 4

a) Look at the following caricatures. Circle the drawing which best depicts the cat's ear position?

0 1 2

b) Look at the shape of the muzzle in the following caricatures. Circle the drawing which appears most like that of the cat?

0 1 2

APPROACH THE CAGE, CALL THE CAT BY NAME & STROKE ALONG ITS BACK FROM HEAD TO TAIL

Question 5

Does it?

Respond to stroking	0

Is it?

Unresponsive	1
Aggressive	2

IF IT HAS A WOUND OR PAINFUL AREA, APPLY GENTLE PRESSURE 5 CM AROUND THE SITE. IN THE ABSENCE OF ANY PAINFUL AREA APPLY SIMILAR PRESSURE AROUND THE HIND LEG ABOVE THE KNEE

Question 6

Does it?

Do nothing	0
Swish tail/flatten ears	1
Cry/hiss	2
Growl	3
Bite/lash out	4

Question 7

General impression

Is the cat?

Happy and content	0
Disinterested/quiet	1
Anxious/fearful	2
Dull	3
Depressed/grumpy	4

Pain Score ... /20

Table 1 The English version of the UNESP-Botucatu-MCPS after content analysis and rearrangement of domains

	Subscale 1: Pain expression (0 – 12)	
Miscellaneous behaviors	Observe and mark the presence of the behaviors listed below	
	A - The cat is laying down and quiet, but moving its tail	A
	B - The cat contracts and extends its pelvic limbs and/or contracts its abdominal muscles (flank)	B
	C - The cats eyes are partially closed (eyes half closed)	C
	D - The cat licks and/or bites the surgical wound	D
	• All above behaviors are absent	0
	• Presence of one of the above behaviors	1
	• Presence of two of the above behaviors	2
	• Presence of three or all of the above behaviors	3
Reaction to palpation of the surgical wound	• The cat does not react when the surgical wound is touched or pressed; or no change from pre-surgical response (if basal evaluation was made)	0
	• The cat does not react when the surgical wound is touched, but does react when it is pressed. It may vocalize and/or try to bite	1
	• The cat reacts when the surgical wound is touched and when pressed. It may vocalize and/or try to bite	2
	• The cat reacts when the observer approaches the surgical wound. It may vocalize and/or try to bite. The cat does not allow palpation of the surgical wound	3
Reaction to palpationof the abdomen/flank	• The cat does not react when the abdomen/flank is touched or pressed; or no change from pre-surgical response (if basal evaluation was made). The abdomen/flank is not tense	0
	• The cat does not react when the abdomen/flank is touched, but does react when it is pressed. The abdomen/flank is tense	1
	• The cat reacts when the abdomen/flank is touched and when pressed. The abdomen/flank is tense	2
	• The cat reacts when the observer approaches the abdomen/flank. It may vocalize and/or try to bite. The cat does not allow palpation of the abdomen/flank	3
Vocalization	• The cat is quiet, purring when stimulated, or miaows interacting with the observer, but does not growl, groan, or hiss	0
	• The cat purrs spontaneously (without being stimulated or handled by the observer)	1
	• The cat growls, howls, or hisses when handled by the observer (when its body position is changed by the observer)	2
	• The cat growls, howls, hisses spontaneously (without being stimulated or handled by the observer)	3
	Subscale 2: Psychomotor change (0 – 12)	
Posture	• The cat is in a natural posture with relaxed muscles (it moves normally)	0
	• The cat is in a natural posture but is tense (it moves little or is reluctant to move)	1
	• The cat is sitting or in sternal recumbency with its back arched and head down; or The cat is in dorso-lateral recumbency with its pelvic limbs extended or contracted	
	• The cat frequently alters its body position in an attempt to find a comfortable posture	3
Comfort	• The cat is comfortable, awake or asleep, and interacts when stimulated (it interacts with the observer and/or is interested in its surroundings)	0
	• The cat is quiet and slightly receptive when stimulated (it interacts little with the observer and/or is not very interested in its surroundings)	1
	• The cat is quiet and "dissociated from the environment" (even when stimulated it does not interact with the observer and/or has no interest in its surroundings) The cat may be facing the back of the cage	2
	• The cat is uncomfortable, restless (frequently changes its body position), and slightly receptive when stimulated or "dissociated from the environment" the cat may be facing the back of the cage	3
Activity	• The cat moves normally (it immediately moves when the cage is opened; outside the cage it moves spontaneously when stimulated or handled)	0
	• The cat moves more than normal (inside the cage it moves continuously from side to side)	1
	• The cat is quieter than normal (it may hesitate to leave the cage and if removed from the cage tends to return, outside the cage it moves a little after stimulation or handling)	2
	• The cat is reluctant to move (it may hesitate to leave the cage and if removed from the cage tends to return, outside the cage it does not move even when stimulated or handled)	3

Validation of the English version of the UNESP-Botucatu multidimensional composite pain scale for assessing postoperative pain in cats

Juliana T Brondani[1], Khursheed R Mama[2], Stelio P L Luna[1*], Bonnie D Wright[2], Sirirat Niyom[2], Jennifer Ambrosio[2], Pamela R Vogel[2] and Carlos R Padovani[1]

Table 1 The English version of the UNESP-Botucatu-MCPS after content analysis and rearrangement of domains *(Continued)*

Attitude	Observe and mark the presence of the mental states listed below	
	A - Satisfied: The cat is alert and interested in its surroundings (explores its surroundings), friendly and interactive with the observer (plays and/or responds to stimuli)*The cat may initially interact with the observer through games to distract it from the pain. Carefully observe to distinguish between distraction and satisfaction games	A
	B - Uninterested: The cat does not interact with the observer (not interested by toys or plays a little; does not respond to calls or strokes from the observer)* In cats which don't like to play, evaluate interaction with the observer by its response to calls and strokes	B
	C - Indifferent: The cat is not interested in its surroundings (it is not curious; it does not explore its surroundings)* The cat can initially be afraid to explore its surroundings. The observer needs to handle the cat and encourage it to move itself (take it out of the cage and/or change its body position)	C
	D - Anxious: The cat is frightened (it tries to hide or escape) or nervous (demonstrating impatience and growling, howling, or hissing when stroked and/or handled)	D
	E - Aggressive: The cat is aggressive (tries to bite or scratch when stroked or handled)	E
	• Presence of the mental state A	0
	• Presence of one of the mental states B, C, D, or E	1
	• Presence of two of the mental states B, C, D, or E	2
	• Presence of three or all of the mental states B, C, D, or E	3
	Subscale 3: Physiological variables (0 – 6)	
Arterial blood pressure	• 0% to 15% above pre-surgery value	0
	• 16% to 29% above pre-surgery value	1
	• 30% to 45% above pre-surgery value	2
	• > 45% above pre-surgery value	3
Appetite	• The cat is eating normally	0
	• The cat is eating more than normal	1
	• The cat is eating less than normal	2
	• The cat is not interested in food	3

Directions for using the scale

Initially observe the cat's behavior without opening the cage. Observe whether it is resting or active; interested or uninterested in its surroundings; quiet or vocal. Check for the presence of specific behaviors (see "Miscellaneous behaviors" above).

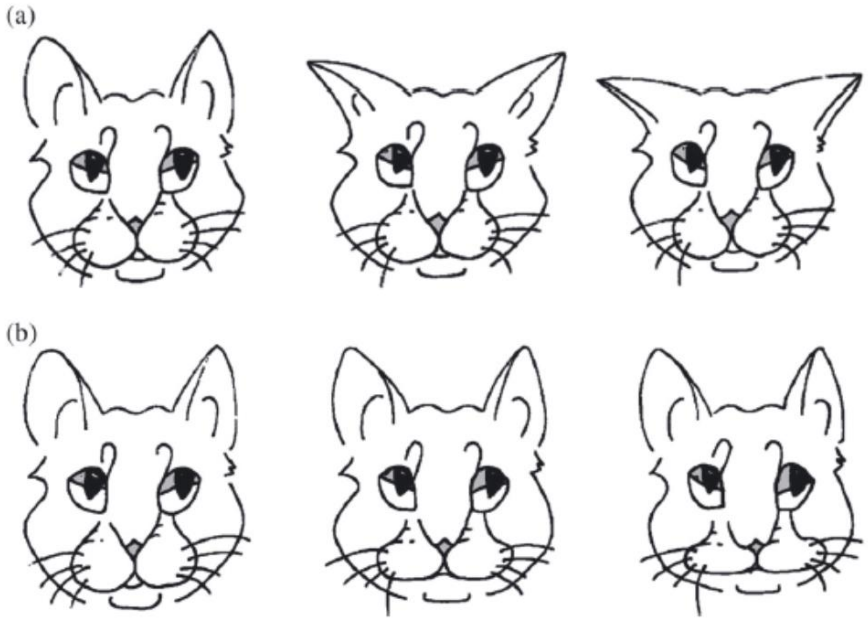
Open the cage and observe whether the cat quickly moves out or hesitates to leave the cage. Approach the cat and evaluate its reaction: friendly, aggressive, frightened, indifferent, or vocal. Touch the cat and interact with it; check whether it is receptive (if it likes to be stroked and/or is interested in playing). If the cat hesitates to leave the cage, encourage it to move through stimuli (call it by name and stroke it) and handling (change its body position and/or take it out of the cage). Observe when outside the cage, if the cat moves spontaneously, in a reserved manner, or is reluctant to move. Offer it palatable food and observe its response.*

Finally, place the cat in lateral or sternal recumbency and measure its arterial blood pressure. Evaluate the cat's reaction when the abdomen/flank is initially touched (slide your fingers over the area) and the in sequence gently pressed (apply direct pressure over the area). Wait for a time, and do the same procedure to assess the cat's reaction to palpation of surgical wound.

*To evaluate appetite during the immediate postoperative period, initially offer a small quantity of palatable food immediately after recovery from anaesthetic. At this moment most cats eat normally independent of the presence or absence of pain. Wait a short while, offer food again, and observe the cat's reaction.

Evaluation of facial expression in acute pain in cats

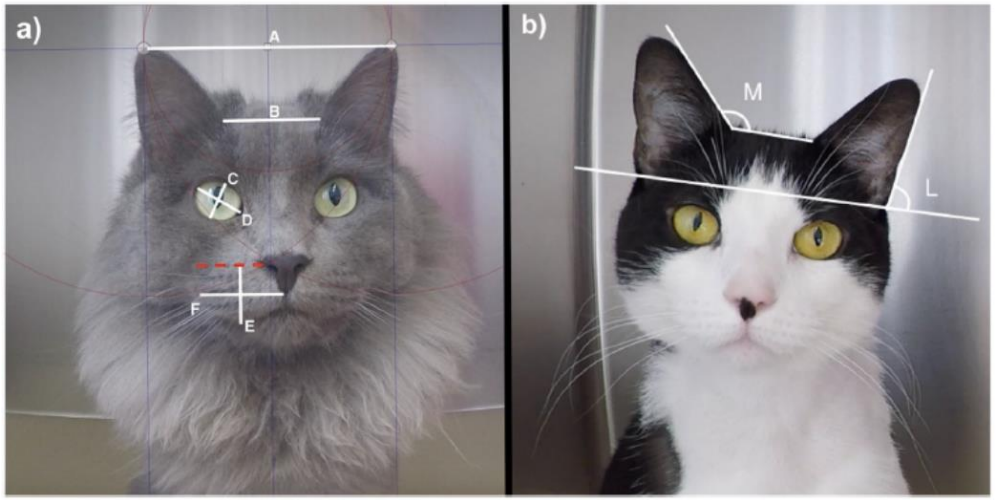
E. Holden*, G. Calvo*, M. Collins*, A. Bell*, J. Reid*, E. M. Scott† and A. M. Nolan‡



2014

Facial expressions of pain in cats: the development and validation of a Feline Grimace Scale

Marina C. Evangelista[1], Ryota Watanabe[1], Vivian S. Y. Leung[1,2], Beatriz P. Monteiro[1], Elizabeth O'Toole[1], Daniel S. J. Pang[1,2,3] & Paulo V. Steagall[1*]



2019

Feline Grimace Scale

Evaluates 5 “action units”

- Ear position
- Orbital tightening
- Muzzle tension
- Whiskers and head position

This is a nice revision

ACUTE PAIN IN CATS

Recent advances in clinical assessment

Paulo V Steagall and Beatriz P Monteiro

Shortcomings with pain assessment

Out of many physiological changes, only **blood pressure** seems to correlate well with pain, and even that is not pathognomonic

Heart rate, pupil size, appetite, and neuroendocrine markers (cortisol, glucose, catecholamines) are not good indicators

Shy and fearful behaviors, and **dysphoria** can confound the assessment

In particular, **upper respiratory tract disease** presents changes in **facial expression**, body **posture**, **depression** and **appetite**, similar to those of **painful cats**

Give up on pain scales?

Still the best option

A large amount of research behind them – new info being generated

It’s a methodical way of examining postop animals

Pick one and try it

Systemic analgesia in cats

Not a lot of new things for acute pain control

NSAIDs have become more **common**

I use **infusions** of **dexmedetomidine** very often (our procedures are 5h average)

NSAIDs

Prescribing practices of veterinarians in the treatment of chronic musculoskeletal pain in cats

Derek E Adrian[1], Mark Rishniw[2], Margie Scherk[3] and B Duncan X Lascelles[1,4,5]

Approximately how often do you see cats with suspected chronic musculoskeletal pain/arthritis, whether based on patient history, exam or radiographic findings?	Responses (n = 1056)	
Daily	167	15.8
Weekly	494	46.8
Monthly	285	27.0
Quarterly	95	9.0
Yearly	15	1.4
Never	0	0
How often do you recommend therapy for these cats?	Responses (n = 1055)	
Never or 0%	1	0.1
<25% of cases	65	6.2
25–50% of cases	136	12.9
50–75% of cases	225	21.3
75–100% of cases	354	33.6
100% of cases	274	26.0
How frequently do clients elect to administer the recommended treatments?	Responses (n = 1055)	
Never or 0%	1	0.1
<25% of cases	277	26.3
25–50% of cases	359	34.0
50–75% of cases	278	26.4
75–100% of cases	120	11.4
100% of cases	20	1.9

Therapeutic	Respondents prescribing (%)
Gabapentin	71.0
Joint supplement	67.8
Meloxicam	64.0
Opioids	62.6
Fish oil	62.1
PSGAGs	61.9
Robenacoxib	50.0
Joint diets	41.6
Prednisolone	34.4
Tramadol	34.0
Methylprednisolone	8.6
Amitriptyline	7.5
Amantadine	6.9
Other NSAID	5.6
Triamcinolone	1.4
Median number prescribed per practitioner	4

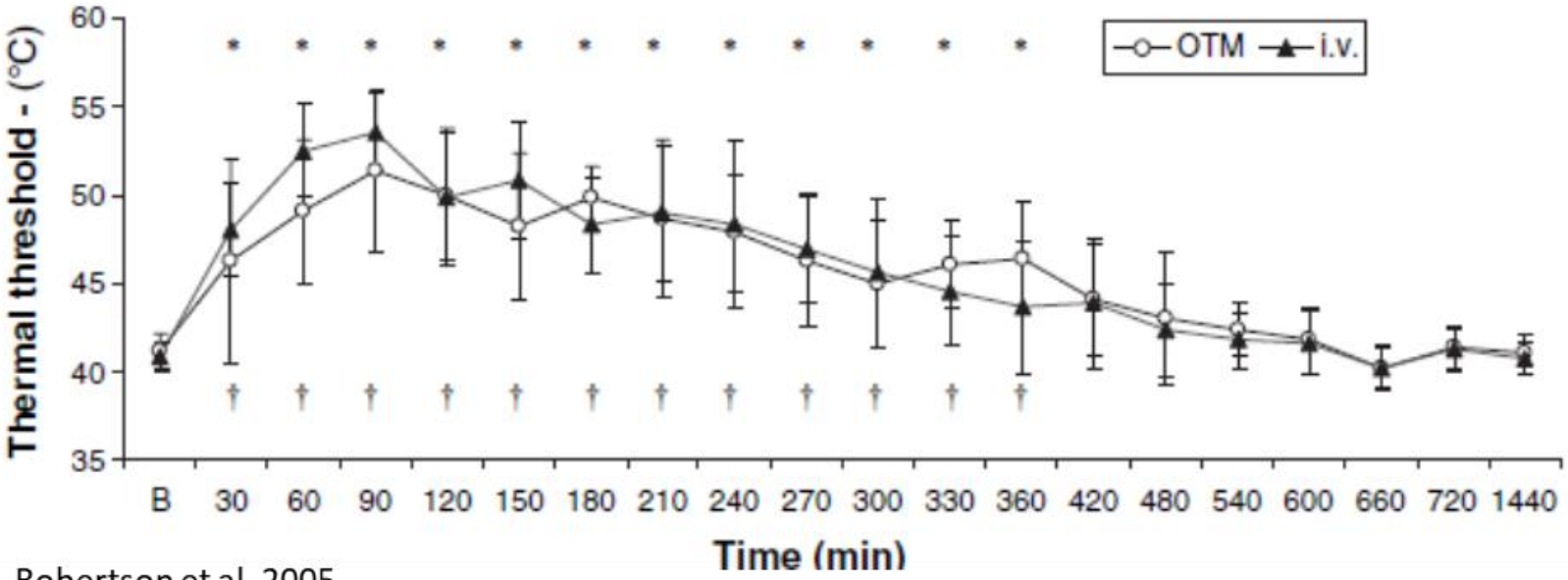
Drug or non-drug therapeutic	Dose amount	Dosing frequency	Dosing duration	Most common formulation
Meloxicam	0.02–0.04 mg/kg (<0.02 to >0.1 mg/kg)	q24h (q12h–q72h; PRN or other)	15–30 days (1 day to >120 days)	Liquid
Robenacoxib	1–2.4 mg/kg (<1 to >2.4 mg/kg)	q24h (q12h–q72h; PRN or other)	4–7 days (1 day to >120 days)	Tablet
Other NSAID	NA	NA	61–120 days (1 day to >120 days)	Tablet
Gabapentin	5.1–10 mg/kg (<5 to >20 mg/kg)	q12h (q12h–q48h; PRN or other)	61–120 days (2–3 days to >120 days)	Compounded
PSGAGs	5 mg/kg (<5 to >5 mg/kg)	q14d (q24h–q30d; other)	>120 days (1 day to >120 days)	NA
Fish oil	50.1–100 mg/kg (<25 to >400 mg/kg)	q48h (q12h–q48h; PRN or other)	>120 days (11–14 days to >120 days)	Liquid
Joint diets	NA	NA	>120 days (1 day to >120 days)	NA
Joint supplements	NA	q24h (q24h–q30d; other)	>120 days (1 day to >120 days)	Capsule or tablet
Tramadol	2.0–4.0 mg/kg (<2 to >4 mg/kg)	q12h (q8h–q24h; PRN or other)	15–30 days (2–3 days to >120 days)	Tablet
Opioids	0.01–0.02 mg/kg (0.005–0.5 mg/kg)	q12h (q8h–q72h; PRN or other)	8–10 day (1 days to >120 days)	Liquid

Buprenorphine and simbadol

There are a lot of studies evaluating the efficacy of buprenorphine in cats

Buprenorphine is an **effective analgesic**. It **does not** cause **emesis**. It has a practical duration of action

Raises **thermal threshold** for **6 hours** after IV or buccal administration



Robertson et al. 2005

Is buprenorphine better than other drugs

It is likely **less** of a **respiratory depressant** than many other opioids

It is a **weak sedative** and **MAC sparing** drug

It can also produce **dysphoria**

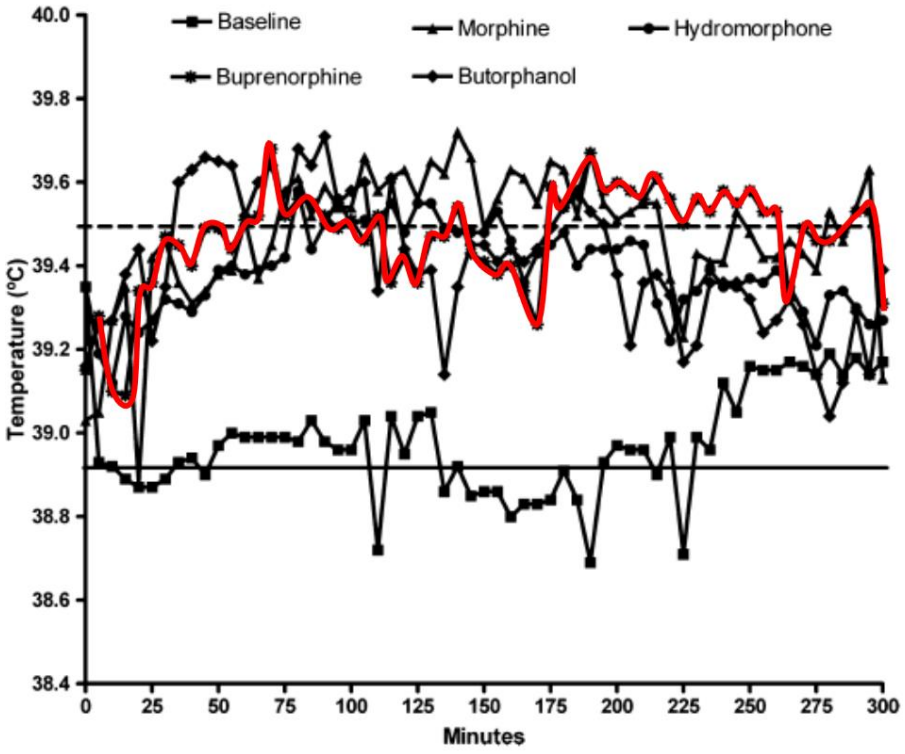
It is very **expensive** in my hospital

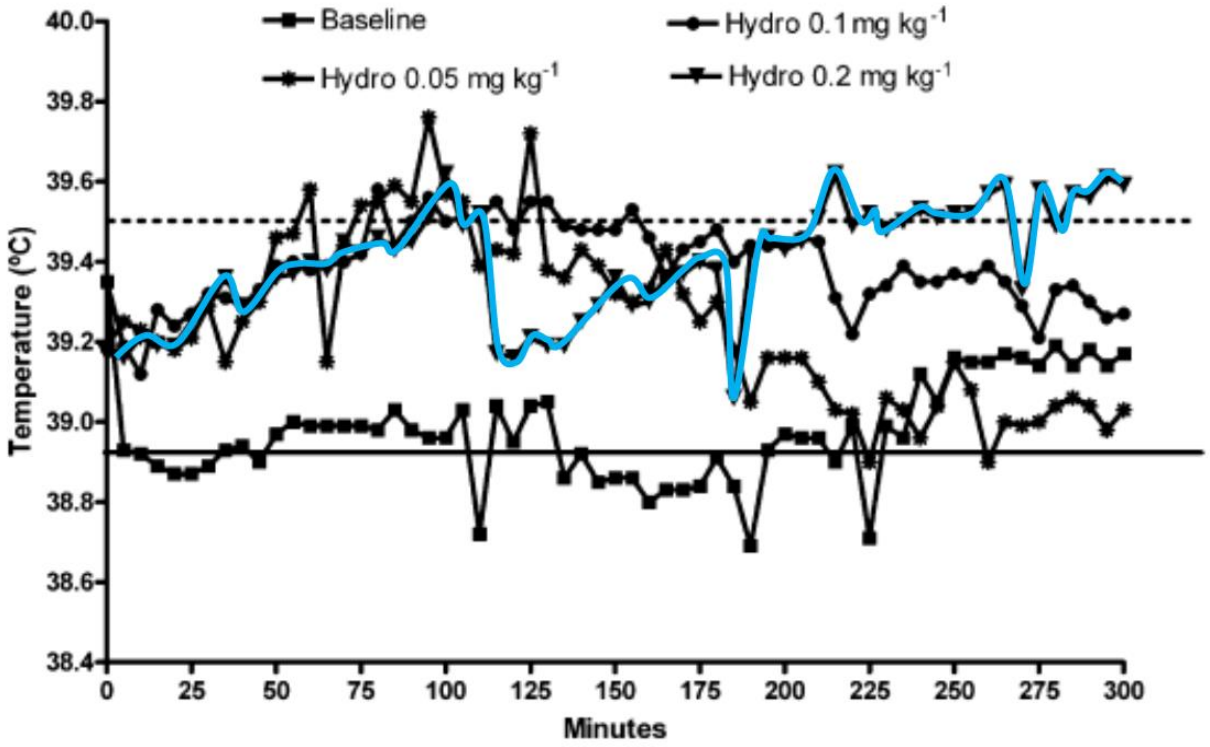
Table 3. Comparative thermal threshold effects of opioids in cats

Opioid, route	Dose (mg/kg)	Onset (min)	Maximum thermal threshold rise (Mean ± SD, Celsius)	Duration (min)	References
Buprenorphine, i.m.	0.01	240	51 ± 4	>480	Robertson *et al.* (2003a)
Buprenorphine, i.v.	0.02	30	53.6 ± 2.1	360	Current paper
Buprenorphine, OTM	0.02	30	51.4 ± 4.5	360	Current paper
Butorphanol, i.m.	0.2	5	50 ± 4	<30	Robertson *et al.* (2003a)
Butorphanol, i.v.	0.1–0.8	15	48.3 ± 6.0	90	Lascelles and Robertson (2004a)
Fentanyl, i.v.	0.01	5	55.3 ± 2.15	110	Robertson *et al.* (2005)
Hydromorphone, i.v.	0.1	15	54.5 ± 1.22	450	Wegner *et al.* (2004)
Hydromorphone, i.m.	0.1	15	49 ± 5.3	345	Lascelles and Robertson (2004b)
Meperidine, i.m.	5	30	50.2 ± 6.7	60	Dixon *et al.* (2002)
Morphine, i.m.	0.2	240	49 ± 5	120	Robertson *et al.* (2003a)

Robertson et al, 2005

Opioids and temperature





Posner LP 2010

How is Simbadol different

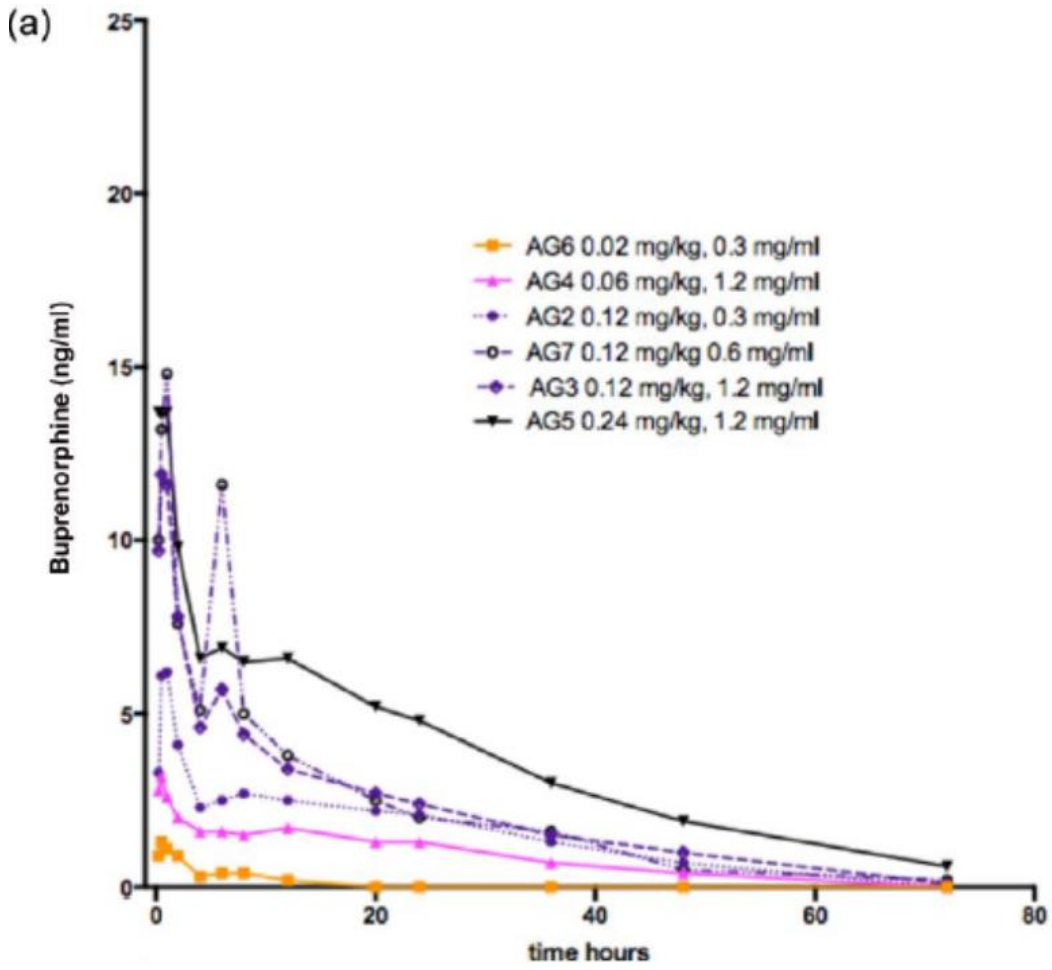
Simbadol is **not a slow-release** drug

It is a **big dose** of buprenorphine (**240** v 20 mcg/kg)

It is more **concentrated** (**1.8** v 0.3 mg/mL)

Approved for once a day for 72 hours

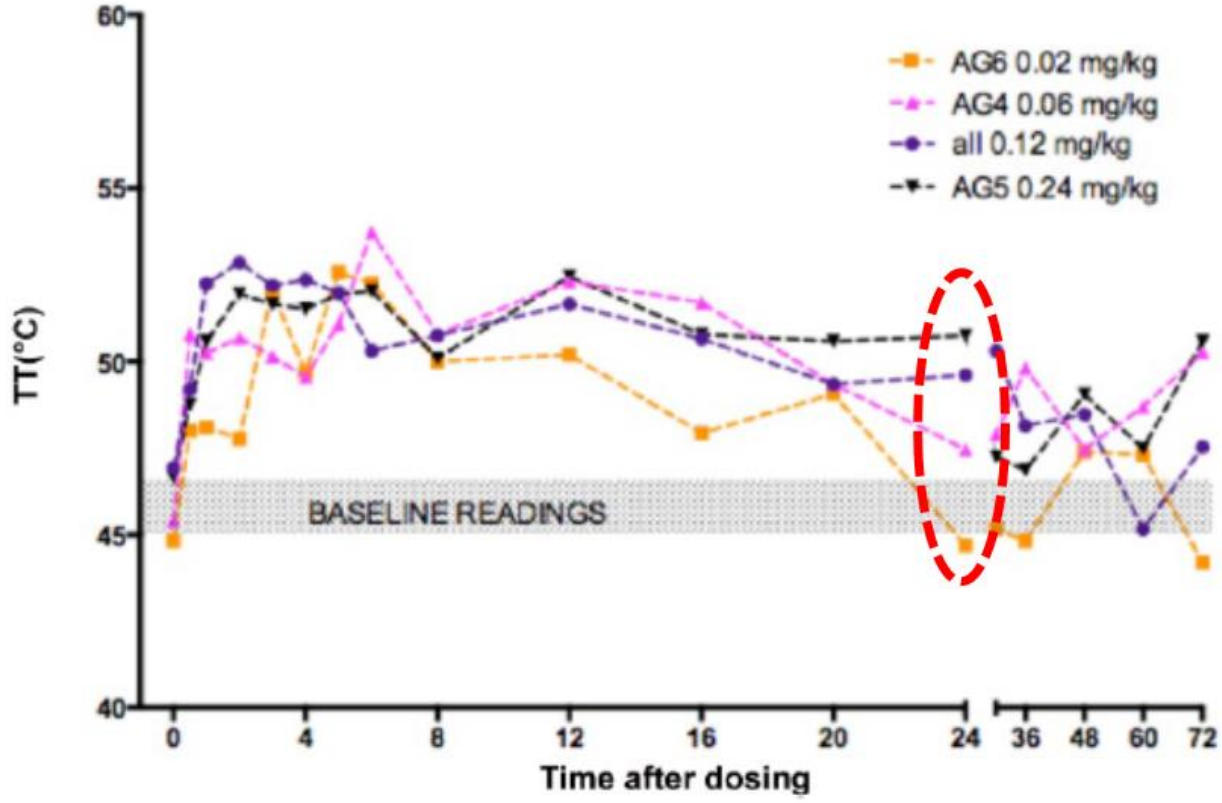
It produces a **large plasma peak** and **takes longer** to eliminate the drug until it is below therapeutic levels



High dose means longer-lasting analgesia

This dosing protocol suggests that analgesia will **not** be **discontinued** if dosed every 24 hours

That is pretty remarkable



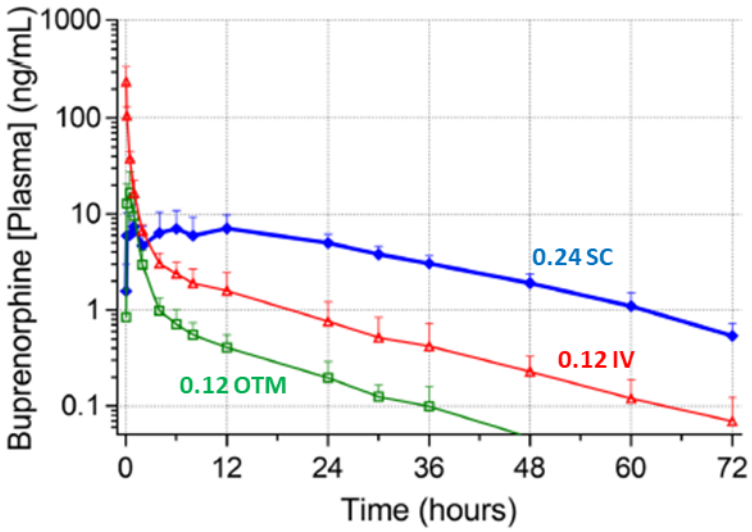
Works with buccal route

Thermal antinociception after buccal administration of a high-concentration formulation of buprenorphine (Simbadol) at 0.24 mg kg^{-1} in conscious cats

Variable	Time (hours)													
	0	0.5	1	2	4	6	8	12	24	30	36	48	60	72
ST (°C)	36.5 ± 0.5	36.9 ± 0.5	37.2 ± 0.6*†	37.1 ± 0.6*	36.9 ± 0.5	36.8 ± 0.4	36.7 ± 0.6	36.7 ± 0.3	36.6 ± 0.5	36.6 ± 0.3	36.7 ± 0.5	36.5 ± 0.4	36.4 ± 0.3	36.4 ± 0.1
ST (°C) Control	*36.3 ± 0.4*	*36.4 ± 0.3*	*36.5 ± 0.1*	*36.2 ± 0.2*	*36.2 ± 0.2*	*36.3 ± 0.2*	*36.3 ± 0.3*	*36.4 ± 0.3*	*36.5 ± 0.2*	*36.5 ± 0.5*	*36.6 ± 0.4*	*36.4 ± 0.4*	*36.4 ± 0.3*	*36.4 ± 0.3*
TT (°C)	45.4 ± 1.5	50.8 ± 3.9*†	51.6 ± 3.5*†	49.9 ± 5.0*†	51.5 ± 4.1*†	50.3 ± 3.3*†	51.1 ± 3.5*†	47.0 ± 2.3	47.3 ± 2.3	45.6 ± 1.4	47.2 ± 1.0	45.8 ± 1.8	45.3 ± 1.1	46.0 ± 2.9
TT (°C) Control	*43.8 ± 2.1*	*44.7 ± 2.7*	*44.2 ± 2.8*	*43.8 ± 1.3*	*43.5 ± 2.0*	*43.5 ± 2.0*	*43.8 ± 2.4*	*44.0 ± 2.2*	*44.2 ± 2.2*	*44.0 ± 2.5*	*45.0 ± 3.3*	*44.6 ± 1.8*	*43.8 ± 1.7*	*44.0 ± 1.8*
HR (beats minute^{-1})	128 ± 6	150 ± 25	164 ± 25†	168 ± 13†	169 ± 17†	162 ± 19†	154 ± 11†	141 ± 13	135 ± 15	130 ± 16	126 ± 12	134 ± 6	132 ± 5	123 ± 9
f_R (breaths minute^{-1})	34 ± 2	36 ± 10	36 ± 5	33 ± 11	35 ± 9	32 ± 9	29 ± 7	27 ± 5	30 ± 7	30 ± 3	30 ± 4	32 ± 6	27 ± 7	31 ± 8
Behavior score	0 (0–0)	2 (1–2)	2 (2–2)	2.5 (2–3)	3 (2–3)	3 (2–3)	2.5 (2–3)	2 (0–3)	0 (0–0)	0 (0–0)	0 (0–0)	0 (0–0)	0 (0–0)	0 (0–0)

*Significant difference from historical saline controls ($p < 0.05$) under same laboratory conditions (Doodnaught et al. 2017b). †Significant difference from baseline values ($p < 0.0052$). Behavior score 0, normal; 1, sedation; 2, euphoria; 3, agitation; 4, dysphoria (Doodnaught et al. 2017a).

Half dose works better than regular buprenorphine



Pharmacokinetic and pharmacodynamic modelling after subcutaneous, intravenous and buccal administration of a high-concentration formulation of buprenorphine in conscious cats

Graeme M. Doodnaught[1], Beatriz P. Monteiro[2], Javier Benito[1], Daniel Edge[3], Francis Beaudry[2], Ludovic Pelligand[4], Paulo Steagall[1,2]*

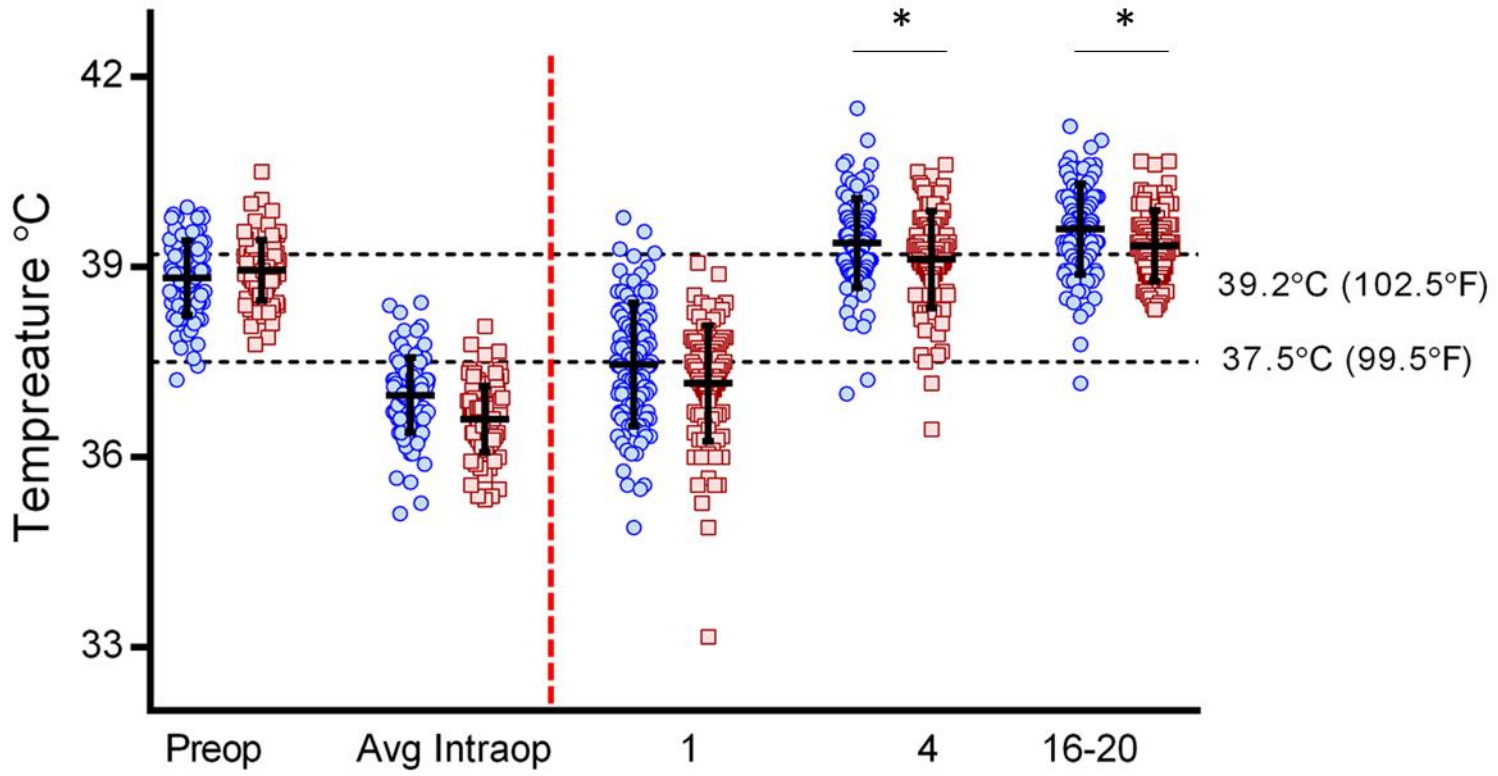
Table 2. Thermal threshold (mean ± SD) in cats after saline (SAL), or buprenorphine administration via the three treatment routes: Intravenous (IV), subcutaneous (SC), and buccal (OTM).

	Route	Time (hours)													
		0	0.5	1	2	4	6	8	12	24	30	36	48	60	72
Variable TT (°C)	SAL (n = 6)	43.8 ± 2.1	44.7 ± 2.7	44.2 ± 2.8	43.8 ± 1.3	43.5 ± 2.0	43.5 ± 2.0	43.8 ± 2.4	44.0 ± 2.2	44.2 ± 2.2	44.0 ± 2.5	45.0 ± 3.3	44.6 ± 1.8	43.8 ± 1.7	44.0 ± 1.8
	IV (n = 6)	45.7 ± 1.8	50.3 ± 3.7†*	49.6 ± 2.4†*	50.2 ± 3.3†*	49.9 ± 2.0†*	48.9 ± 5.0*	50.2 ± 5.0†*	46.4 ± 2.2	48.5 ± 4.4	46.2 ± 2.2	46.7 ± 2.5	45.1 ± 1.9	45.7 ± 2.4	46.7 ± 2.6
	SC (n = 6)	45.6 ± 1.1	49.4 ± 2.3	49.7 ± 4.1†*	49.2 ± 3.1*	50.2 ± 4.6†*	50.9 ± 3.7†*	51.1 ± 4.2†*	49.7 ± 3.1†*	49.7 ± 3.3†*	49.3 ± 3.2*	49.0 ± 2.8	48.0 ± 4.0	45.1 ± 1.7	45.8 ± 1.6
	OTM (n = 6)	46.1 ± 1.6	49.3 ± 4.8	49.5 ± 4.8†*	51.2 ± 3.9†*	50.5 ± 3.7†*	48.6 ± 4.2*	50.4 ± 4.3†*	49.4 ± 3.8*	47.7 ± 2.2	46.8 ± 1.3	47.1 ± 1.2	46.0 ± 1.2	46.7 ± 1.4	46.4 ± 1.2

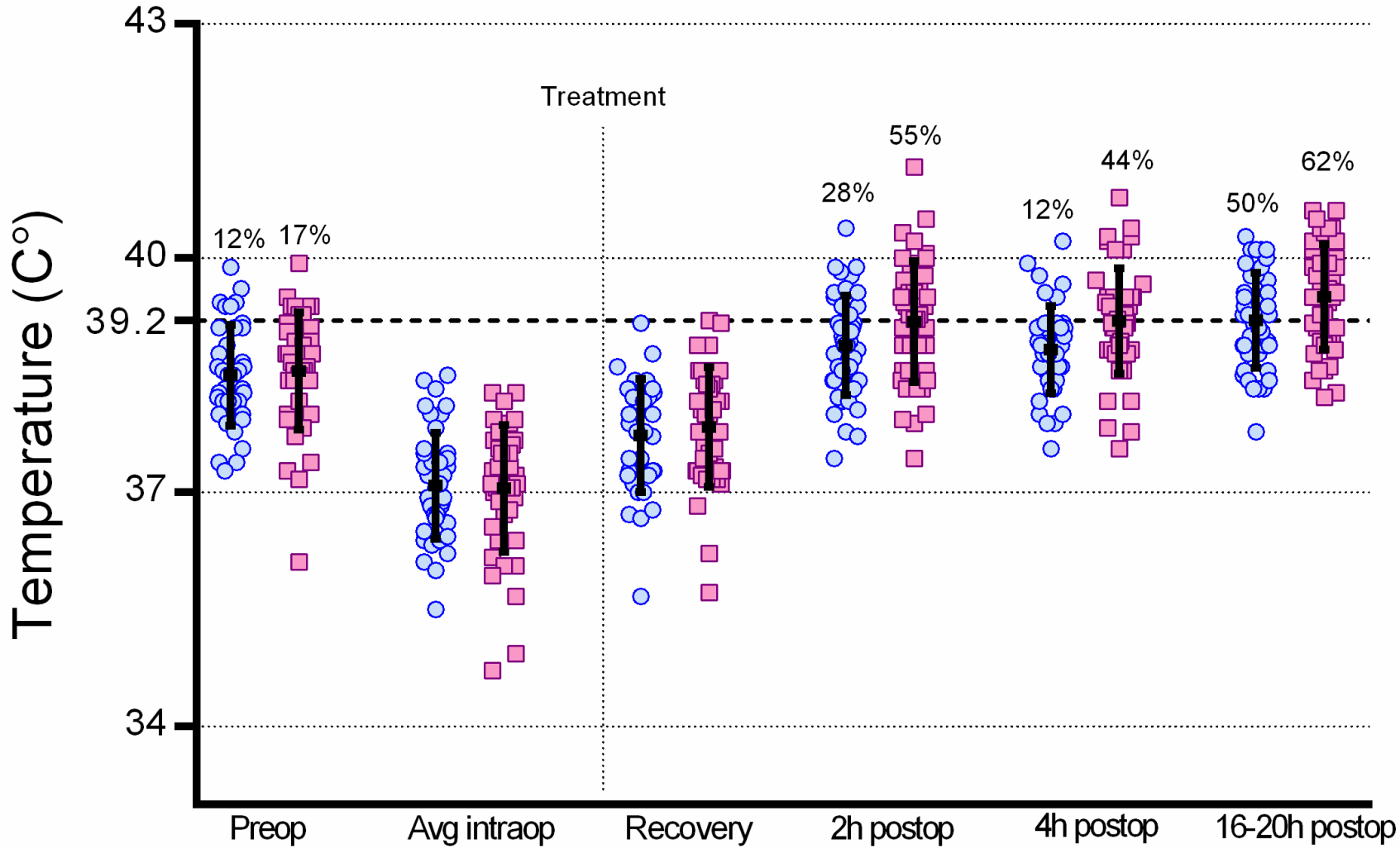
TT (Thermal threshold); SAL (Saline SC); IV (0.12 mg kg^{-1} buprenorphine IV); SC (0.24 mg kg^{-1} buprenorphine SC); OTM (0.12 mg kg^{-1} buprenorphine buccal route of administration).

Simbadol and temperature

200 cats given **Simbadol** (blue) or **morphine** (red) at recovery from OVH



More data


Temperature (C°)
43
40
39.2
37
34
Treatment
12%
17%
28%
55%
12%
44%
50%
62%
Preop
Avg intraop
Recovery
2h postop
4h postop
16-20h postop

Simbadol prolongs hyperthermia

Cats look restless (are they comfortable?)

We have not yet seen any consequences

It has not delay discharge or reduce appetite

We also found **no differences** in terms of **analgesia**

- 8/47 (**17%**) cats received rescue in the **Simbadol** (0.24 mg/kg) group over 24 hours
- 3/47 (**6%**) cats received rescue in the **morphine** (0.1 mg/kg) group over 24 hours

Costs
(as of last week)

Buprenorphine: $26 (0.3 mg/mL)

Morphine: $9 (10 mg/mL)

Simbadol: $41 (1.8 mg/mL)

Nocita

Nocita is a **slow-release**, liposome-encapsulated, formulation of bupivacaine

Liposomes open at different speeds and release the drug (**almost**) continuously

It often results in **peaks** and **valleys** of drug release

It is only licensed for **infiltration of the knee for dogs** and for **declaws in cats**

It is **not** a **cheap** drug ($141/10mL)

NOCITA®

(bupivacaine liposome injectable suspension)

13.3 mg/mL

For use as a peripheral nerve block in cats only

Local Anesthetic

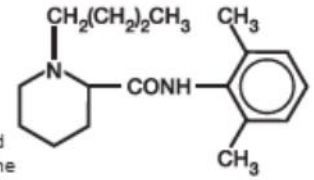
Single use vial

Caution:

Federal (USA) law restricts this drug to use by or on the order of a licensed veterinarian.

Description:

NOCITA® (bupivacaine liposome injectable suspension) is a sterile, non-pyrogenic white to off-white, preservative-free, aqueous suspension of multivesicular lipid-based particles containing bupivacaine. Each milliliter of NOCITA contains 13.3 mg/mL of bupivacaine. Inactive ingredients and their nominal concentrations are: cholesterol, 4.7 mg/mL; 1,2-dipalmitoyl-sn-glycero-3 phospho-rac-(1-glycerol) (DPPG), 0.9 mg/mL; tricaprylin, 2.0 mg/mL; and 1,2 dierucoylphosphatidylcholine (DEPC), 8.2 mg/mL. Bupivacaine is related chemically and pharmacologically to the amide-type local anesthetics. Chemically, bupivacaine is 1-butyl-N-(2, 6-dimethylphenyl)-2-piperidinecarboxamide with a molecular weight of 288.4. Bupivacaine structural formula is shown in the illustration to the right.



Indication:

For use as a peripheral nerve block to provide regional postoperative analgesia following onychectomy in cats.

Dosage and Administration:

NOCITA is for administration only once prior to surgery. Administer 5.3 mg/kg per forelimb (0.4 mL/kg per forelimb, for a total dose of 10.6 mg/kg/cat) as a 4-point nerve block (described below) prior to onychectomy. Administration prior to surgery may provide up to 72 hours of pain control.

Table C-4. Number and Percent Effectiveness for NOCITA and Saline (Placebo) Groups at each Time Interval

Time Interval for Pain Evaluation	NOCITA	Saline
0-24 hours	88/117 (75.2%)	48/119 (40.3%)
0-48 hours	79/115 (68.7%)	41/118 (34.7%)
0-72 hours	78/114 (68.4%)	42/119 (35.3%)

Legend

- Needle insertion point
- Needle advancement
- Drug injection point
- Needle withdrawal + drug injection
- Needle redirection to a 90° angle to the palmar plane

Abbreviations

SpU - Styloid process of the ulna

ACb - Accessory carpal bone

Dose Volume per Injection (% of total 0.4 mL/kg/forelimb volume) and Description

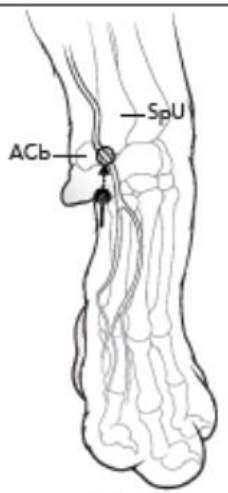
A. 0.14 mL/kg (35%)

Superficial Branch of the Radial Nerve: At the center of the limb, on the dorsal aspect at the level of the antebrachiocarpal joint, insert the needle subcutaneously with the bevel up (•). Advance the needle subcutaneously as depicted by the dotted line and arrow and inject (○) adjacent to the confluence of the accessory cephalic and cephalic veins.

Dorsal

B. 0.08 mL/kg (20%)

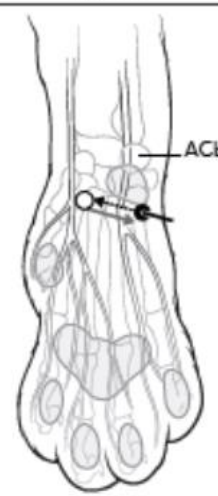
Dorsal Branch of the Ulnar Nerve: Palpate a groove between the accessory carpal bone (ACb, in the base of the carpal pad) and the styloid process of the ulna (SpU). Distal to this groove, insert the needle subcutaneously with the bevel up and advance the needle proximally. Inject once the tip reaches the midpoint of the groove.



Lateral

C. 0.16 mL/kg (40%)

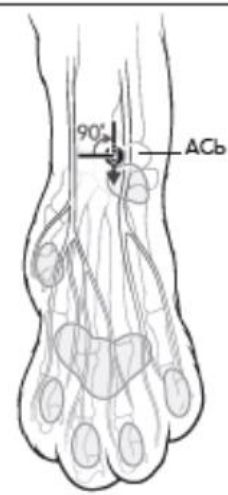
Median Nerve and Superficial Branch of the Palmar Branch of the Ulnar Nerve: Insert the needle subcutaneously with the bevel up lateral to the distal tip of the accessory carpal pad and advance the needle medially 2/3 the width of the limb, until the tip is located near the base of the first digit. Inject 2/3 of the volume at this point and the remaining volume while withdrawing the needle (solid grey arrow). Gently massage for 5 seconds.



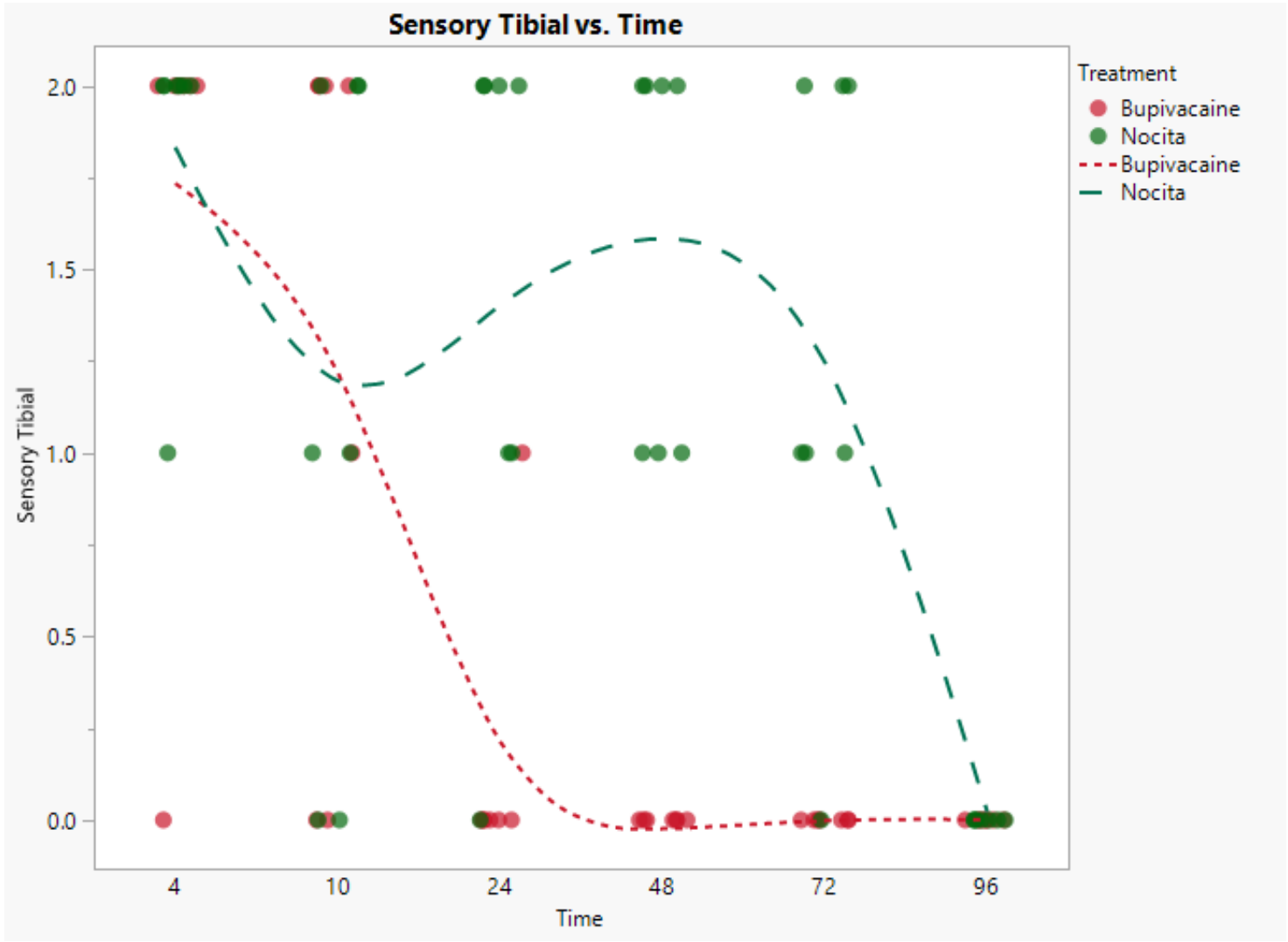
Palmar

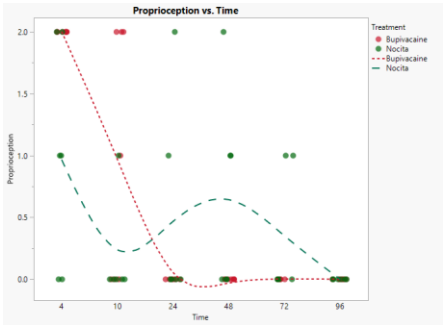
D. 0.02 mL/kg (5%)

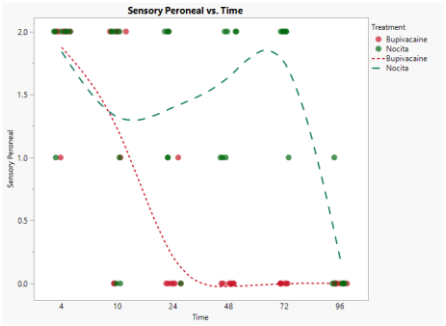
Deep Branch of the Palmar Branch of the Ulnar Nerve: Orient the needle perpendicular to the long axis of the limb at the level of the ACb. Insert the needle subcutaneously and advance the needle laterally until it contacts the medial aspect of the ACb. Redirect the needle dorsally by rotating the needle 90°, advance it along the medial side of the ACb 2-3 mm until it penetrates the flexor retinaculum, and inject.

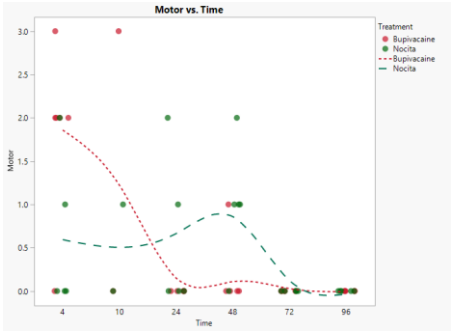


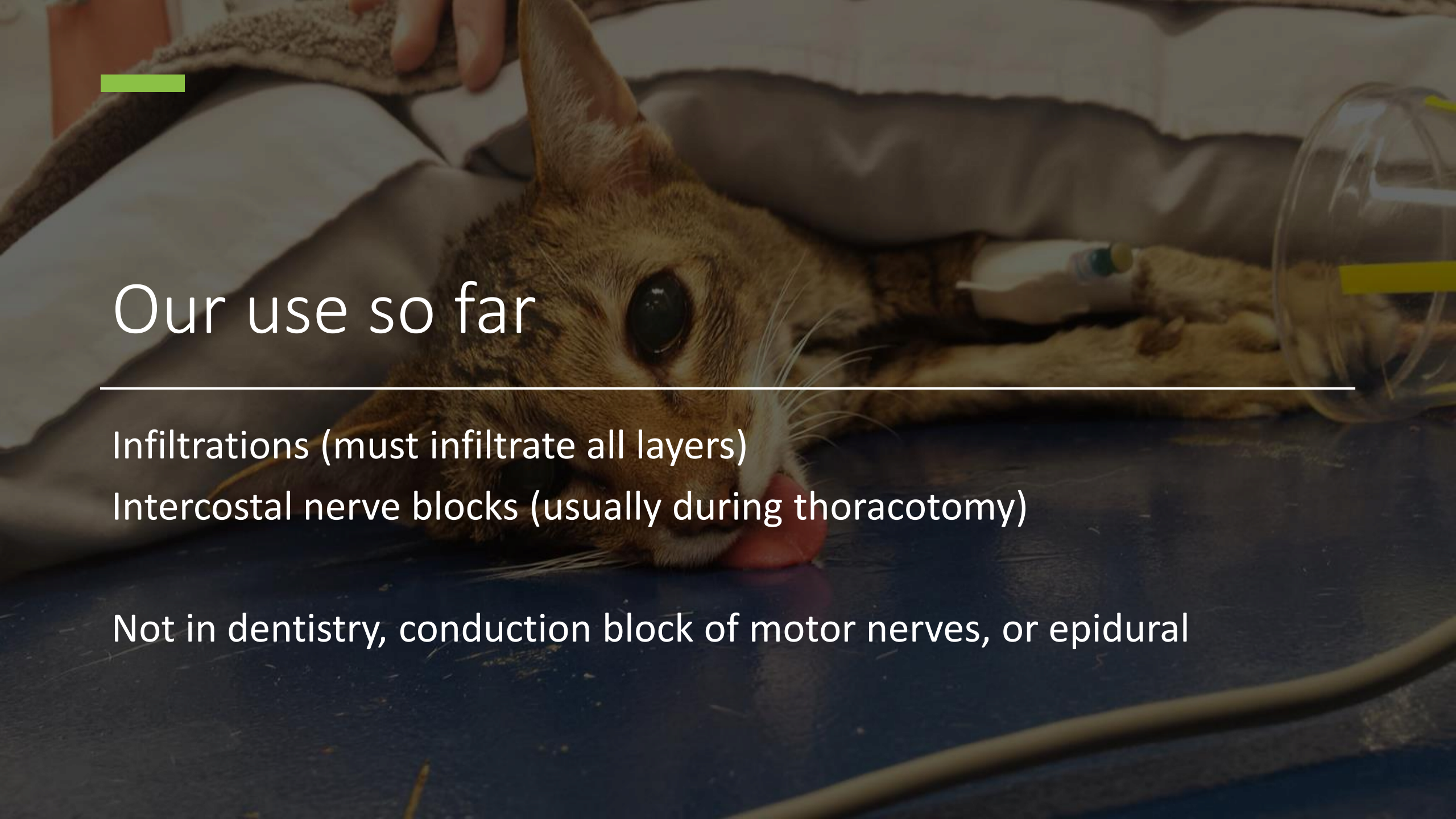
Palmar


Sensory Tibial vs. Time
Sensory Tibial
2.0
1.5
1.0
0.5
0.0
4
10
24
48
72
96
Time
Treatment
Bupivacaine
Nocita
Bupivacaine
Nocita


Proprioception vs. Time
Proprioception
Time
Treatment
Bupivacaine
Nocita
Bupivacaine
Nocita


Sensory Peroneal vs. Time
Sensory Peroneal
Time
Treatment
Bupivacaine
Nocita
Bupivacaine
Nocita


Motor vs. Time
Motor
Time
Treatment
Bupivacaine
Nocita
Bupivacaine
Nocita



Our use so far

Infiltrations (must infiltrate all layers)

Intercostal nerve blocks (usually during thoracotomy)

Not in dentistry, conduction block of motor nerves, or epidural

A couple of words on epidural anesthesia

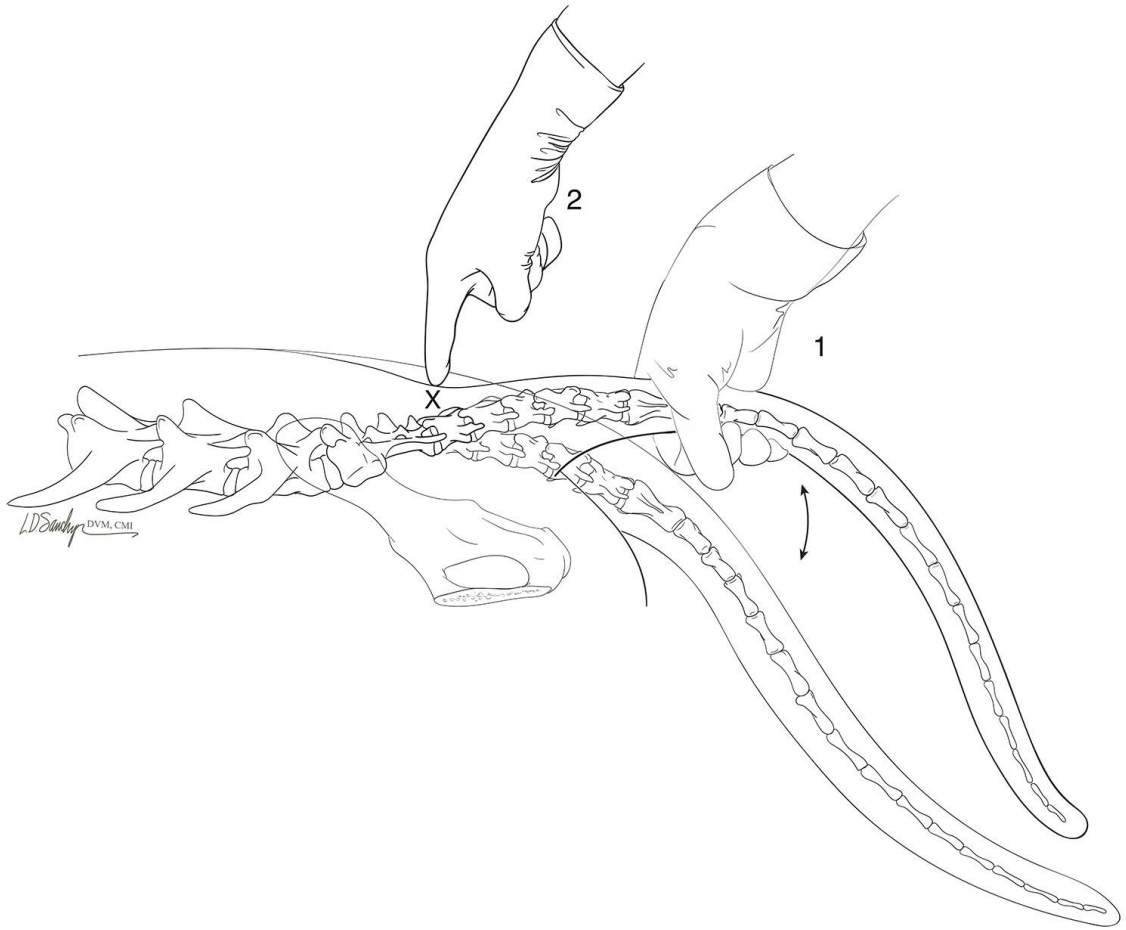
LS epidural in cats carries a real **risk** of inadvertent **dural puncture**

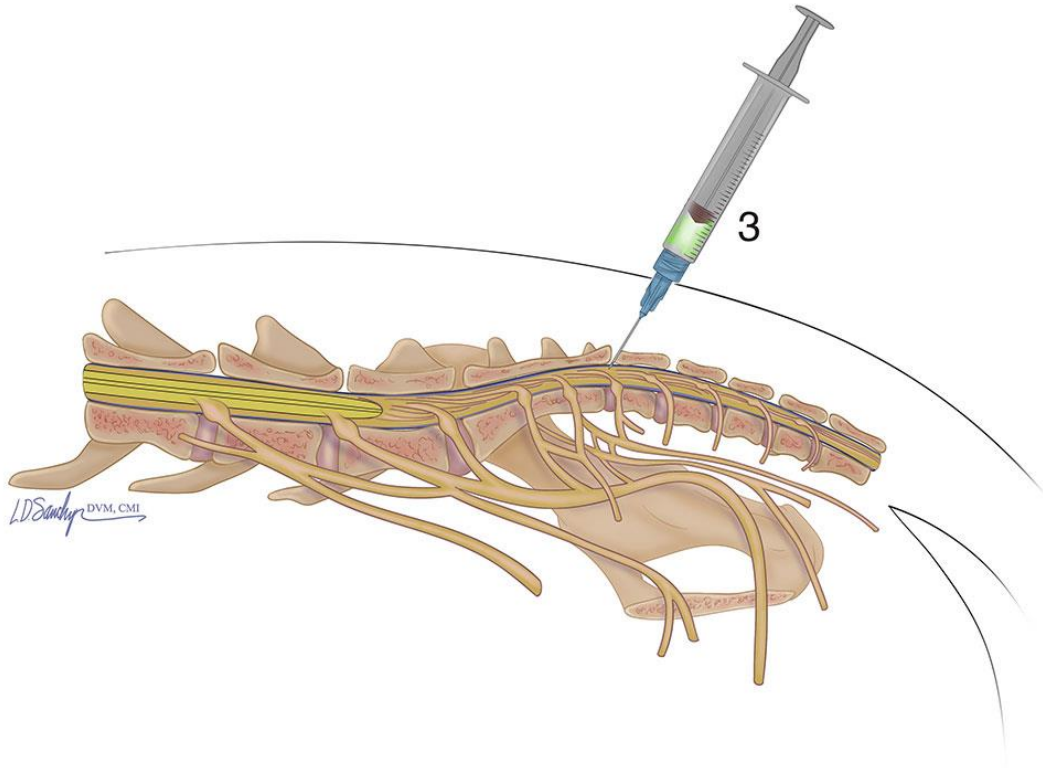
Accidental **spinal injection** could range from grave to **fatal**

The risk is a lot **lower** if doing **SC puncture**

I find SC punctures difficult to perform

SC epidural in cats



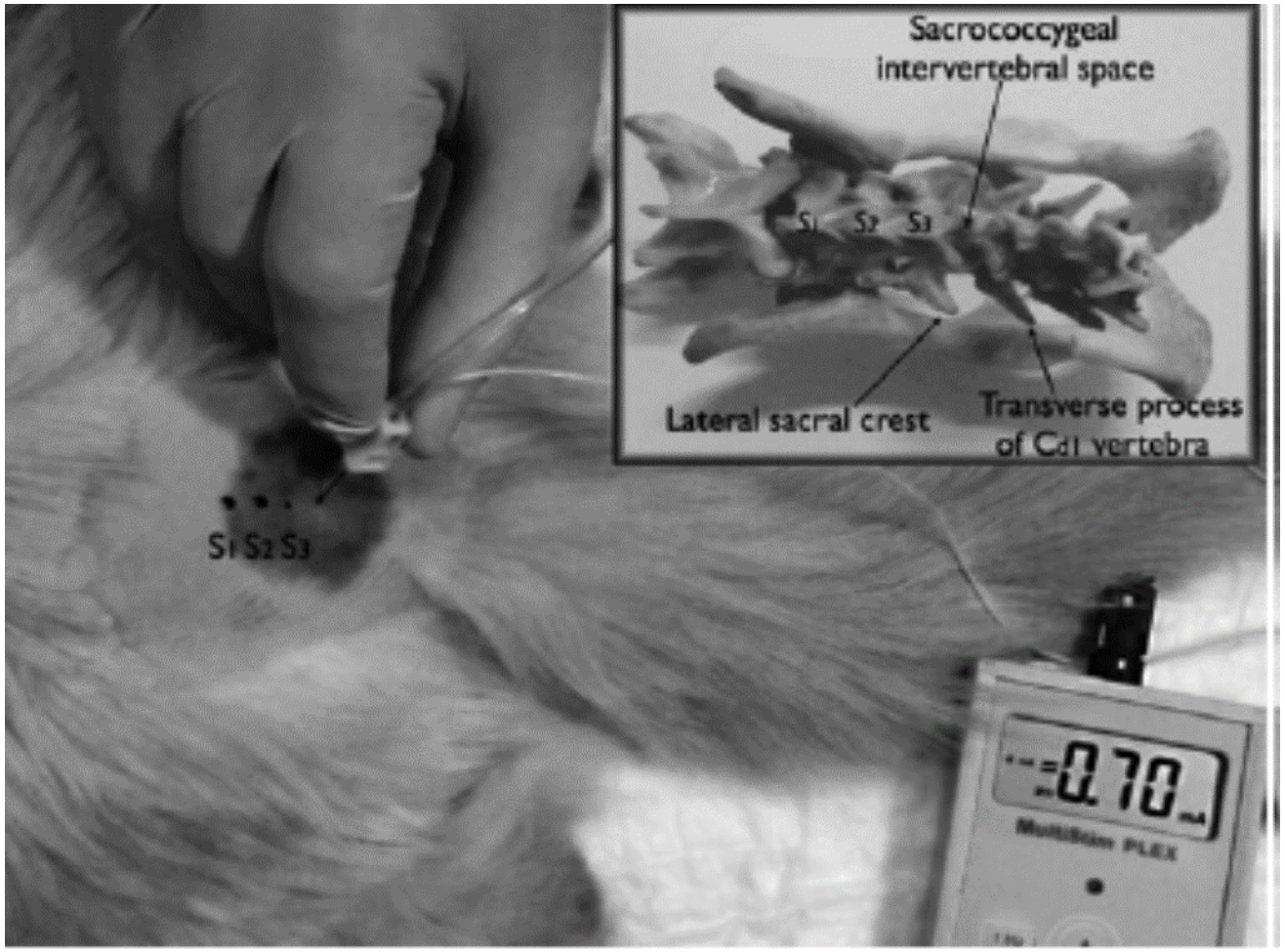


SC epidural in cats

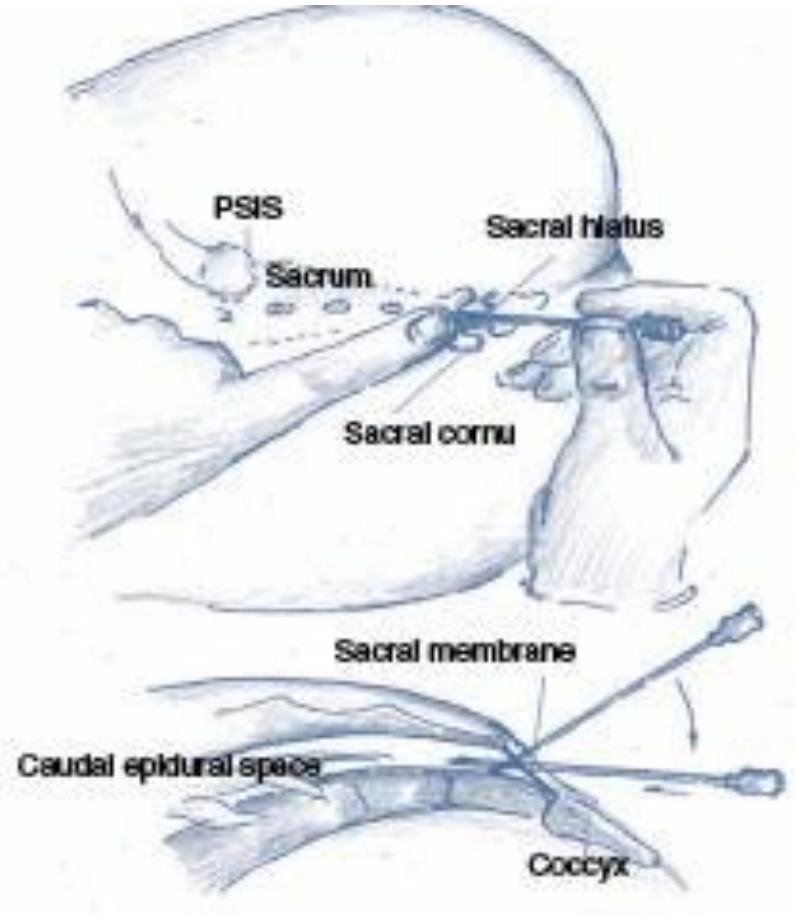
SHORT COMMUNICATION

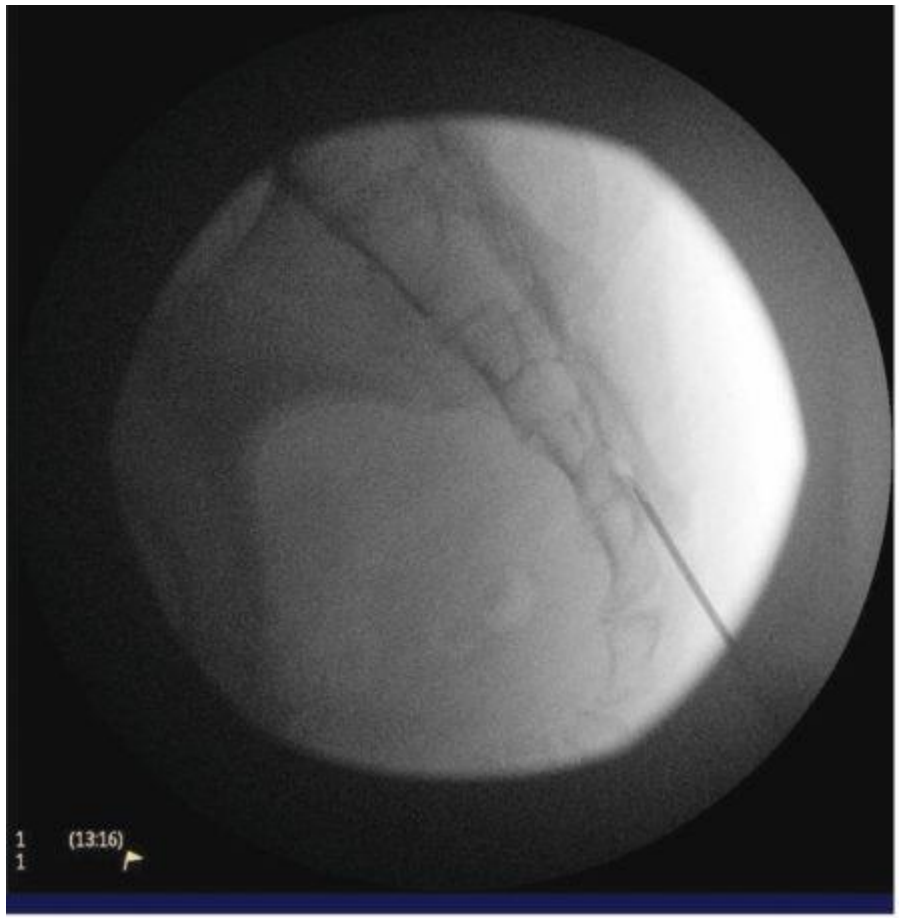
The use of a nerve stimulation test to confirm sacrococcygeal epidural needle placement in cats

Pablo E Otero*, Natali Verdier*, Andrea S Zaccagnini*, Santiago E Fuensalida*, Lisa Tarragona* & Diego A Portela†



Caudal block in pediatrics





SC epidural in cat

Anesthesia and GI dysfunction

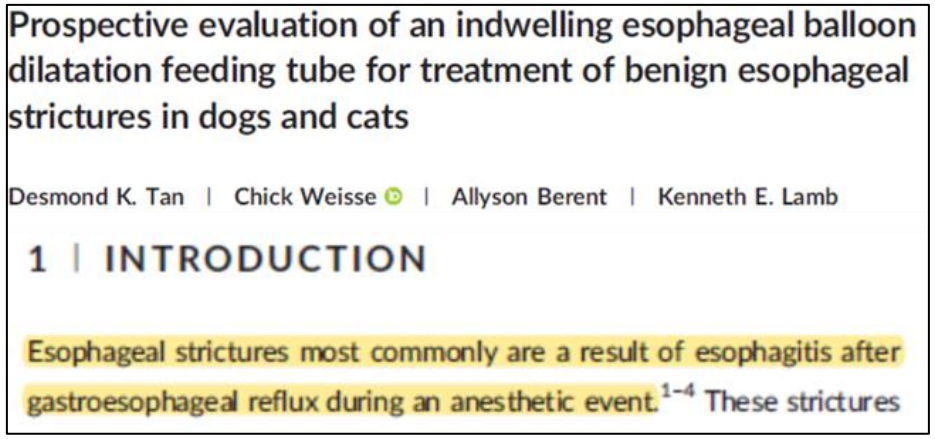
GA predisposes to transient intolerance to enteral diet

Common consequences:

Nausea, Regurgitation, Vomiting, **GER** (also ileus and diarrhea)

GER may be **silent** and contribute to **esophagitis** and **strictures**

GER and its potential consequences

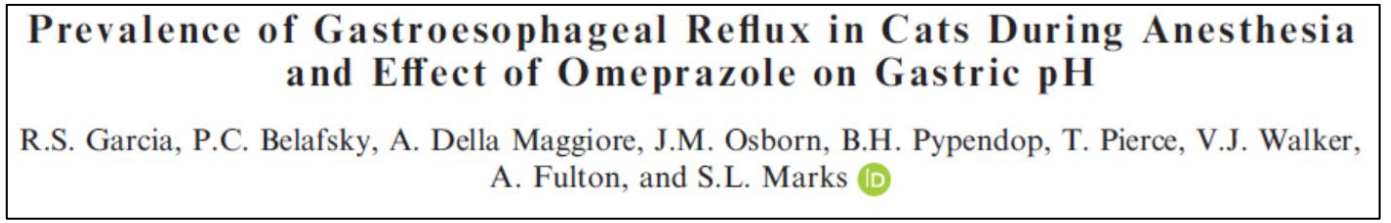


Prospective evaluation of an indwelling esophageal balloon dilatation feeding tube for treatment of benign esophageal strictures in dogs and cats

Desmond K. Tan | Chick Weisse | Allyson Berent | Kenneth E. Lamb

1 | INTRODUCTION

Esophageal strictures most commonly are a result of esophagitis after gastroesophageal reflux during an anesthetic event.[1–4] These strictures



Prevalence of Gastroesophageal Reflux in Cats During Anesthesia and Effect of Omeprazole on Gastric pH

R.S. Garcia, P.C. Belafsky, A. Della Maggiore, J.M. Osborn, B.H. Pypendop, T. Pierce, V.J. Walker, A. Fulton, and S.L. Marks

Incidence of **GER** in cats was **16**%, **23**% and **33**% in three studies

In this study **gastric** pH was **2.8** (1.0) if **untreated**, and **7.2** (0.4) if treated with **omeprazole**

Esophageal pH was **5.3** (0.9) if **untreated** (<4.0 in 3/13 cats), and **6.8** (0.4) if **treated**

In previous study **GER** during **anesthesia** was suspected as the **cause** for **strictures** in **64-70%** of cases

Strategies for **GER**

Increase pH. We use **omeprazole** the evening before and **pantoprazole** IV prior to anesthesia

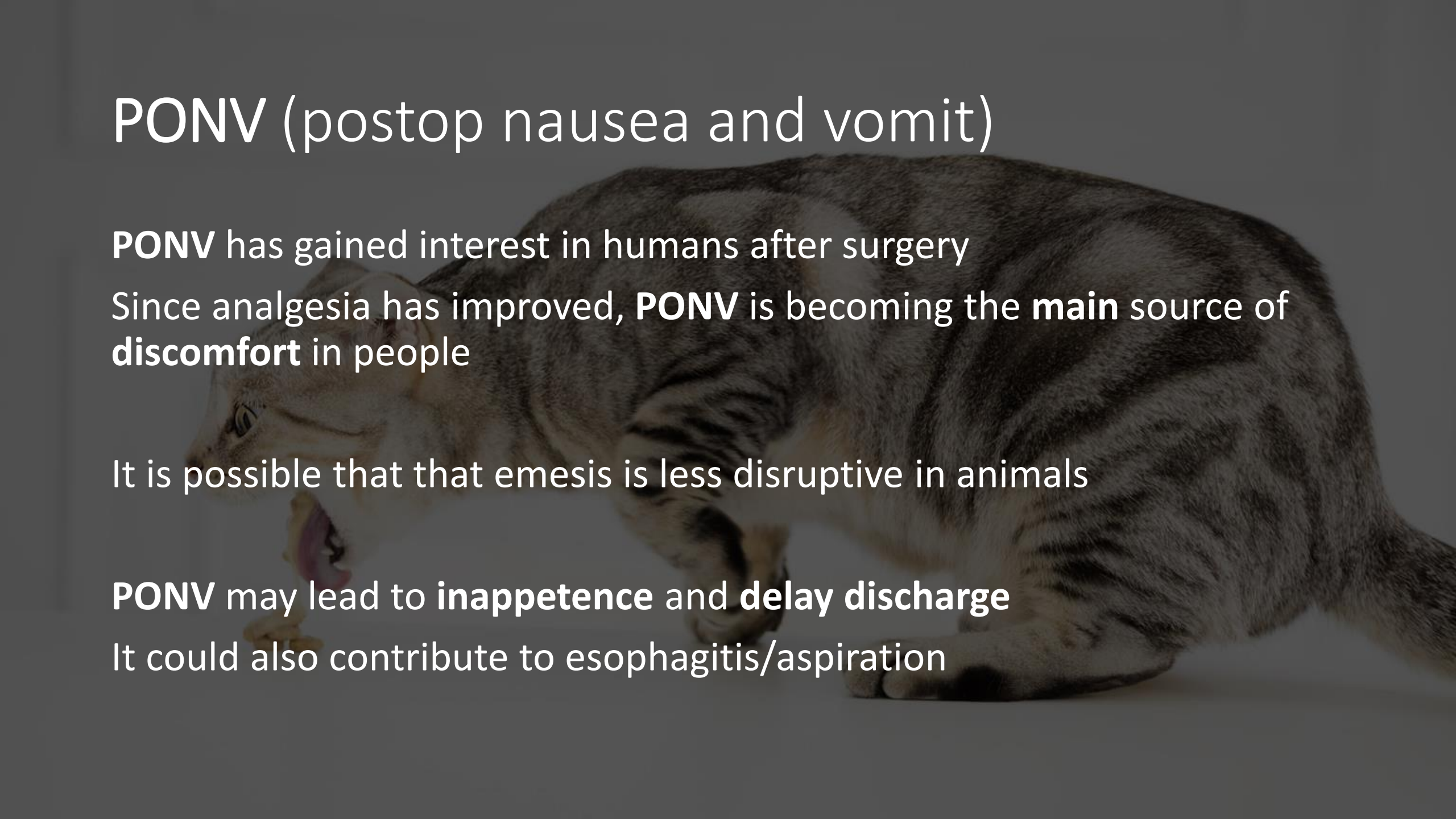
Proton pump inhibitors appear to be more effective than **H2 blockers**

In dogs, **opioid** use is **associated** with increased incidence of **GER**

OFA can be a viable alternative in **some cases**

No info on butorphanol/buprenorphine

PONV (postop nausea and vomit)



PONV has gained interest in humans after surgery

Since analgesia has improved, **PONV** is becoming the **main** source of **discomfort** in people

It is possible that that emesis is less disruptive in animals

PONV may lead to **inappetence** and **delay discharge**

It could also contribute to esophagitis/aspiration

Strategies for PONV

We have found maropitant our best answer for emesis

We administer it PO 4-24 hours prior to anesthesia, or IV immediately prior

We have abandoned SC injections

We have mostly abandoned other antiemetics

Sometimes we administer ondansetron for signs of nausea

Effects of maropitant in cats receiving dexmedetomidine and morphine

OBJECTIVE

To evaluate the effects of maropitant in cats receiving dexmedetomidine and morphine.

DESIGN

Randomized controlled trial.

ANIMALS

66 healthy female domestic shorthair cats.

PROCEDURES

Cats were randomly assigned to receive maropitant (1 mg/kg [0.45 mg/lb], SC; maropitant group; n = 32) or saline (0.9% NaCl) solution (0.1 mL/kg [0.045 mL/lb], SC; control group; 34) 20 hours before IM administration of dexmedetomidine (20 µg/kg [9.1 µg/lb]) and morphine (0.1 mg/kg). Following administration of dexmedetomidine and morphine, the incidences of emesis, retching, and signs of nausea (sialorrhea and lip licking) were compared between the 2 groups. The aversive behavioral response of each cat to injection of maropitant or saline solution was scored on a visual analogue scale by each of 4 observers who were unaware of the treatment administered.

RESULTS

Only 1 of 32 cats in the maropitant group vomited, whereas 20 of 34 control cats vomited. The incidences of emesis and retching for the maropitant group were significantly lower than those for the control group. The incidence of signs of nausea did not differ between the 2 groups. Visual analogue scale scores for the maropitant group were significantly higher than those for the control group.

Evaluation of oral maropitant as an antiemetic in cats receiving morphine and dexmedetomidine

Table 1 Incidence of emesis, retching, sialorrhea and lip-licking in cats receiving maropitant 8 mg PO administered 18 h prior to dexmedetomidine 20 µg/kg and morphine 0.1 mg/kg IM, or no antiemetic treatment (control)

	Incidence of emesis	Incidence of retching	Incidence of sialorrhea	Incidence of lip-licking
Maropitant	4% (2/46)	8% (4/46)	21% (10/46)	30% (14/46)
Control	40% (20/50)	40% (20/50)	22% (11/50)	52% (26/50)
P value	0.0002	0.0003	1.0	0.04

Maropitant administered orally 2–2.5 h prior to morphine and dexmedetomidine reduces the incidence of emesis in cats

Table 1 Incidence of sialorrhea, lip licking, retching and emesis in cats receiving maropitant 8 mg orally administered 2–2.5 h prior to dexmedetomidine 20 µg/kg and morphine 0.1 mg/kg intramuscularly, and in cats not treated with antiemetic (control)

	Sialorrhea	Lip licking	Retch	Emesis
Control	4/43 (9%)	17/44 (39%)	16/44 (36%)	14/44 (32%)
Maropitant	8/38 (21%)	11/39 (28%)	5/39 (13%)	5/39 (13%)
P value	0.12	0.22	0.012	0.03

Thank you very much

mm459@cornell.edu