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Surgical Savvy

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Scrubbing In With...

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Tracie Rindfield is a Senior Surgical Scientist at MPI Research in Mattawan, Michigan. Tracie has been employed at MPI Research for 16 years. She started in Small Animal Toxicology and with the help of many mentors has made her way up to a surgeon.

In 2002, Tracie first attended the annual ASR meeting in Greenville, SC where her and a co-worker inadvertently booked air fare for Greenville NC. After attending that meeting, she was committed to taking the Surgical Research Specialist (SRS) exam the following year. She received her SRS certification in 2003. In addition, she acquired her Laboratory Animal Technician (LAT) certification from AALAS in 2006.

Tracie is currently serving as Treasurer for the ASR Board.

Tracie is grateful for her family. She has two beautiful children; Shelbi and Kaleb. She is married to David, her husband of 17 years. Strong family support is an important factor in her success.

Lisa Johnson BA, LAT, LATg, SRS

Lisa obtained her BA in biology in 1983 from Keuka College in the Finger Lakes region of New York State, where experience gained during internships made her realize that she didn't really want to be a veterinarian after all since she couldn't handle half of the clients (and she'd never heard of laboratory veterinarians at that time). Lisa worked for several years in laboratory research before finding her way back into the animal field. She began working at a Contract Research Laboratory in Worcester, MA (the facility which would later on be purchased by Charles River) in 1990, where she fell into the area of surgical research (she was one of the few who didn't mind spending the long hours in surgery). Around 1994, she had the good fortune of working with Dr. Vince Mendenhall, who convinced her that technicians could do surgery. Vince is the one who gave Lisa the confidence she would later need to learn new models practically on her own.

Lisa is currently a senior surgical technician at Pfizer in Andover, MA. She oversees the controlled substances program and assists with the surgical schedule. She is involved with tendon defect projects and mouse telemetry projects. In 2009, Lisa gave a presentation at the AALAS National meeting pertaining to the ASR Certification Program. This year, she was first author on a poster comparing buprenorphine to fentanyl transdermal patches in rabbits undergoing bilateral ulna osteotomies, which was accepted at both ASR's and AALAS's annual meetings. This poster won the Michael DeLeo Award at ASR's meeting.

Lisa has been involved with ASR since she was certified in 1997, and has been serving on the BOD since 2007 as a Member at Large, and was on the Certification Committee for two years prior to becoming Chairperson of the committee in 2008. Building the Certification Program is an on-going goal of hers and she hopes to continue to make improvements and move in the right direction.

Comparison of Buprenorphine and Fentanyl Transdermal Patch for Analgesia in New Zealand White (NZW) Rabbits Undergoing Bilateral Ulna Osteotomy

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Abstract

In an effort to refine surgical pain management for rabbits on a bone healing study, the use of fentanyl transdermal patches was compared to previous method using twice daily subcuticular (SQ) administration of buprenorphine. Twenty NZW male rabbits, six months old, were divided into two study groups (n=10) to represent each analgesic regimen. In both groups, animals were provided pre-emptive analgesia using buprenorphine. Post operative analgesia was provided by either 25 ug/hr fentanyl transdermal patch or 0.04 mg/kg buprenorphine given BID. All rabbits were evaluated twice daily after surgery for signs of pain, mobility, food consumption and fecal/urine output. A canine analog pain evaluation form was modified for use in assessing effectiveness of analgesia with lower scores indicating better analgesia. Post operative aggregate pain scores for fentanyl treated rabbits were lower than the buprenorphine treated group. During the first several days post surgery, appetite and fecal / urine output returned to baseline levels more quickly in the fentanyl group compared to buprenorphine treated rabbits. Based on these findings, fentanyl transdermal patches were observed to provide improved analgesic coverage post orthopedic surgery in NZW rabbits.

Introduction

Providing sufficient post-surgical analgesia is critical to animal welfare and is an on-going concern. Dosing schedules and assuring continuous coverage can be a challenge when staff is not on-site during evening hours. Traditionally, buprenorphine was given twice a day for analgesia at our facility. If analgesia appeared insufficient, buprenorphine was supplemented with a nonsteroidal anti-inflammatory drug (NSAID). Despite accepted benefits of multi-modal analgesia (1), NSAIDs were not routinely used for osteotomy studies at our facility due to their potential to impact bone healing (2). In an attempt to improve analgesic coverage and provide steady blood levels of drug, we were interested in switching to fentanyl patches (3). When a literature search failed to locate a paper comparing fentanyl patch and buprenorphine in rabbits, it was decided to conduct a study prior to changing methods.

Materials/Methods

Twenty New Zealand White male rabbits, six months old, were assigned to an IACUC approved protocol to undergo bilateral ulna osteotomy with ectopic implants in muscle. The rabbits were received from an approved vendor and acclimated in our facility for a minimum of two weeks prior to enrollment in the study. Rabbits were randomly assigned to have surgery on one of two days. All rabbits were induced with ketamine (30mg/kg, IM) and xylazine (5mg/kg, IM), and received cephazolin (17mg/kg, SC, b.i.d. x 3 days). Rabbits on the first day were given buprenorphine SQ at a dose of 0.04mg/kg while being prepared for surgery. The inside of one ear was shaved and cleaned with 70% alcohol. After drying the skin, a 25ug/hr fentanyl patch was positioned near the middle of the ear, where the surface was relatively flat. Firm pressure was applied to the patch for a full minute (Fig. 1). Rabbits on the second day of surgery received buprenorphine at the dose listed above b.i.d. starting the morning of surgery and ending the afternoon two days post-surgery (total 6 doses).

A canine analog pain evaluation form was adapted for use in rabbits to assess effectiveness of analgesia (Fig. 2). Using this pain scoring method, four categories were rated on a scale of zero to three. The score given for all categories was combined for a total score. Rabbits were scored on AM and PM day 1 post surgery, and AM day 2 post surgery. All rabbits were evaluated twice daily after surgery for signs of pain, mobility, food consumption and fecal/urine output.

Fig. 1 Fentanyl patch placed pre-surgically in rabbit's ear.

Animal ID: Date: AM/PM

Assessment Criteria/ Score	0	1	2	3
Attitude and Posture - from distance, no handling	Alert, ears up, eyes bright and open, relaxed; either at the front of the cage or laying normally in relaxed posture at back of cage	Notices and watches tech, ears not fully up, less relaxed muscles, quieter; eyes open; comes to front of cage or relaxes in normal position in back of cage	Decreased activity, squinted, dull eyes, ears down; tense posture, in back of cage, doesn't lie normally, "in-wardly" focused	No interest in tech unless cage opened or animal handled; hunched posture, dull appearance; eyes very squinted or bulging
Gait and Movement - distance observation	Normal movement around cage; fully weight baring; hops around cage; rises up on haunches	Moves slowly and carefully, but freely, around cage; not hesitant to move but may move slowly, gingerly; at least touches limb to floor	Non-weight baring; very stiff movement, sits or lies abnormally, sits with legs placed abnormally, moves with effort and reluctantly, may need to be prompted to move	Very reluctant or unwilling to move; may fall asleep while sitting; may appear frantic
Appetite	Normal	May eat less than normal, but eating something, even if it's only treats	Has not eaten in past 24 hours	No interest in food/water/ enrichment for more than 24 hours
Elimination	Normal	Decreased output over 24 hours	Decreased urine; little or no feces over 24 hours	No urine or feces over 24 hours
				Total

Fig. 2: Analog form used to assess rabbits post-operatively.

Results

All rabbits recovered well post-operatively and did not experience any post-surgical complications. All fentanyl patches remained effectively in place for the 72 hours post-surgery with good dermal contact, and were removed the morning of day 3 post surgery. The rabbits receiving a fentanyl patch appeared brighter and more active than the rabbits receiving buprenorphine b.i.d. All but one rabbit in the fentany group showed normal food consumption and fecal/urine output within two days post-surgery, while all but two of the rabbits in the buprenorphine group showed decreased input/output through day 5 post-surgery. One buprenorphine treated rabbit didn't display normal input/output until day 6 post-surgery.

On the first morning post-surgery, the mean +/- S.E.M. score for the fentanyl group was 5.1 +/- 0.4 while the comparable score for the buprenorphine group was 6.4 +/- 0.4, p= 0.03, ANOVA. The greatest difference between groups was seen in the afternoon of the first day post-surgery, when the fentanyl group mean +/- S.E.M. score was 2.7 +/- 0.4 while the buprenorphine group was 7.2 +/- 0.3, p = 0.0001. By the morning of the second day post-surgery, there was little difference between the two groups (4.2 +/- 0.4 for the fentanyl group vs. 4.8 +/- 0.4 for the buprenorphine group, p=0.29). On average, the rabbits in the fentanyl group returned to normal food in-take and urine/fecal output three days sooner than the buprenorphine group. A summary of data for individual rabbits appears in Fig. 3.

AVERAGE PAIN SCORES AND OBSERVATIONS SUMMARY

Treatment	Animal Number	Day 1 Post-sx AM	Day 1 Post-sx PM	Day 2 Post-sx AM	Resumed Normal Appetite / Urine and Fecal Output	Monitoring continued beyond 2 days post-surgery
Fentanyl Patch	137	6.5	3.5	4	Day 2	
	138	5	2	2	Day 2	
	139	2	1.5	5	Day 2	
	140	5	2	3	Day 2	
	141		1	4	Day 3	
	142	5	5	5	Day 6	Yes, decreased consumption, x3 days
	143	5	3	4	Day 2	
	144	5	2	6	Day 2	
	145	6	4	5	Day 2	
	146	6	3	4	Day 2	
	AVG.	5	3	4	Day 2	
Buprenorphine	147	6	7.5	4.5	Day 5	Yes, decreased consumption, x3 days
	148	5	7.5	4	Day 5	Yes, decreased consumption, x3 days
	149	8	7.5	5.5	Day 5	Yes, decreased consumption, x3 days
	150	4	8	4	Day 5	Yes, decreased consumption, x3 days
	151	6	8	5	Day 5	Yes, decreased consumption, x3 days
	152	8	8	4	Day 6	Yes, decreased consumption, x4 days
	153	6	7	5	Day 5	Yes, decreased consumption, x3 days
	154	6	5	3	Day 2	Yes, decreased consumption, x3 days
	155	7	7	8	Day 5	Yes, decreased consumption, x3 days
	156	8	6	5	Day 5	Yes, decreased consumption, x3 days
	AVG.	6	7	5	Day 5	

Fig. 3. Summary of observations. The total pain score for each animal is the sum of four categories. The maximum obtainable score is 12. These scores were then averaged for each time point within a group.

Discussion

Switching from administration of buprenorphine twice daily to fentanyl transdermal patches in rabbits for post-operative analgesia has enabled us to improve the post-operative clinical appearance of our rabbits on orthopedic surgery models. In addition, rabbits have exhibited a more rapid return to baseline levels of appetite and fecal/urine output. The improvement in clinical appearance is captured by comparison of pain scores and differences in scores were statistically significant the first day post surgery. Although our pain scoring evaluation is subjective in nature, it has provided a more consistent tool to evaluate the same parameters using well defined scores. To minimize the variability, the of post-operative scoring was completed by two surgery technicians for the duration of the post-operative phase.

The fentanyl transdermal approach has provided dual benefit for our animal care program. First and foremost, it has improved analgesic coverage and welfare for the rabbits. Second, it has allowed some flexibility in timing of morning and evening evaluations by technical staff. Although our preference would be to consistently use NSAIDs in combination analgesic treatment, scientific justification has limited our use in this model to an as needed basis (2). Overall, use of fentanyl patches has provided a refinement that we hope to extend to other species used in our vivarium.

After completion of this study, two items have become routine additions to our conduct of this model. First, a total pain score of 8 has been established as the level to initiate notification of veterinarians and consideration of supplemental analgesia or additional supportive care. Second, local infiltration of bupivicaine is provided prior to surgery. Both additions have provided further study refinements.

Conclusion

Fentanyl transdermal patches provided improved analgesic coverage and recovery when compared to twice daily administration of buprenorphine in NZW rabbits on a orthopedic study. The comparison was based primarily on post-operative pain scores and return to baseline level of appetite, urine, and fecal output. When applied to the inner pinna, the fentanyl transdermal patch was well tolerated by the animals and has become one of the preferred methods for pain management in our vivarium. Whenever possible, the use of adjunctive methods such as local analgesia or blocking alternate pathways are also applied.

References

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Tech Tips

By Tracie Rindfield
L.A.T., S.R.S.

Rodent Ventilation Without Intubation

If you've ever worked with rodents, one of the hardest procedures to perform reliably is endotracheal intubation. You're either good at it or you're intimated by it. Practice does make perfect, but who has time for that?

One of our main problems is that after someone has been trained and becomes proficient in rat intubation, they may not need to perform this procedure for several months. Within that time, the person may lose proficiency and confidence at the technique. Other complications associated with intubation are:

- Technically challenging (time consuming and stressful)
- Tissue trauma can be caused to the larynx
- Post-intubation complications due to trauma (e.g. swelling)
- Length of intubation tube can vary from one rat to another or male to female

While on a quest to find a more reliable procedure I was given a golden nugget. The simple ventilation technique described below was shown to me by Farhad Forudi, a technologist from the Cleveland Clinic. The technique saves so much time and reduces the other potential complications of intubation!

Once the animal is anesthetized, place a modified Foley catheter over the animal's nose. Secure the thin rubber band behind the upper incisors (tape can be used as a substitute for a rubber band if the incisors are too small) and viola you're animal is ventilated.

One of the complications we've encountered is ventilating the stomach along with the lungs. Steve McBrian, my co-worker and expert at this technique, will manipulate the head to insure the animal's lungs are ventilated and not their stomach.

We use some of the following techniques if you encounter this problem;

- Straighten out the neck
- Pull the rubber band tighter
- Place a rolled gauze under the head/neck
- Turn down the ventilator volume
- Reposition the arms

Additional items you will need;

- Ventilator; I use a Harvard Small Animal Ventilator – Volume Controlled Single Animal
- Thin Rubber Band
- Tape
- 12Fr or 14Fr Bard Foley Catheter (123614A); trimmed to ~ 1"

Once you figure out all the little quirks it's like riding a bike, no matter how long it's been you can pick it right back up

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