# Effects of one-week versus one-day preoperative treatment with topical 1% prednisolone acetate in dogs undergoing phacoemulsification

Nancy J. McLean, DVM, DACVO; Daniel A. Ward, DVM, PhD, DACVO;
Diane V. H. Hendrix, DVM, DACVO; Rachel K. Vaughn, DVM, DACVO

**Objective**—To compare the effects of 2 preoperative anti-inflammatory regimens on intraocular inflammation following phacoemulsification.

**Design**—Randomized controlled trial

**Animals**—21 dogs with immature cataracts.

**Procedures**—All dogs had cataract surgery via phacoemulsification, and most received prosthetic intraocular lenses. Dogs were randomly divided into 2 groups. Group A dogs were treated topically with prednisolone acetate for 7 days prior to surgery, whereas prednisolone acetate treatment commenced the evening prior to surgery in group B dogs. Postoperative care was identical for both groups. Blood-aqueous barrier breakdown was quantified by use of anterior chamber fluorophotometry, with fluorescein entry into the anterior chamber measured 2 and 9 days after surgery compared with baseline scans obtained prior to surgery. Ophthalmic examinations were performed before surgery and 1 day, 9 days, 3 weeks, 7 weeks, 3 months, and 6 months after surgery. A subjective inflammation score was established at each examination. Intraocular pressures were measured 4 and 8 hours after surgery and at each follow-up examination.

**Results**—There was no difference in the extent of blood-aqueous barrier disruption between the groups at 2 or 9 days after surgery. Subjective inflammation scores were also similar at most time points. Dogs in group A developed postoperative ocular hypertension at a higher frequency (60%) than did those in group B (18%).

**Conclusions and Clinical Relevance**—In dogs that underwent cataract surgery via phacoemulsification, a full week of topical prednisolone acetate treatment prior to surgery did not decrease postoperative inflammation, compared with commencement of topical prednisolone acetate treatment the evening prior to surgery, and was associated with a greater incidence of postoperative ocular hypertension. (*J Am Vet Med Assoc* 2012;240:563–569)

Cataract extraction in dogs is a very common surgery in veterinary ophthalmology, with an estimated 4,000 procedures being performed annually in the United States.[1] A variety of extraction techniques are available to the veterinary ophthalmic surgeon, but some variation of phacoemulsification with prosthetic lens implantation is considered the optimal approach.[2–4] Reported success rates are difficult to compare because of differences in definitions of success, methods of surgery, skill and experience of the surgeon, patient selection, perioperative medical management, stage of cataract development, presence or absence of lens-induced uveitis, and follow-up periods.[2,5–15] Despite this variability, there is still widespread agreement that, in general, successful surgical outcomes have improved dramatically during the past several decades, from a reported low of 29% in 1957[5] to more recently reported rates of 79%,[14] 83%,[15] and 98.6%.[13] The most important factors contributing to increased success are most likely a change from intracapsular to extracapsular techniques and the advent of phacoemulsification, which permits ultrasonic fragmentation and aspiration of cataractous lenses through small incisions.[2,16] Other contributing factors include the evolution of phacoemulsification technology, introduction of ophthalmic viscosurgical devices, improvements in anti-inflammatory agents, and continued refinement of residency training programs. Despite these improvements, complications still occur and most are attributable to perioperative inflammation.

Despite the popularity of cataract surgery and the widespread use of perioperative topically administered corticosteroids, a consensus recommendation for an appropriate preoperative corticosteroid treatment regi-

**Abbreviations**

| | |
|---|---|
| %INC[FI] | Percentage increase in anterior chamber fluorescein concentration |
| IOP | Intraocular pressure |

From the Department of Small Animal Clinical Sciences, College of Veterinary Medicine, University of Tennessee, Knoxville, TN 37996. Dr. McLean's present address is VCA Veterinary Care Animal Hospital and Referral Center, 9901 Montgomery Blvd, Albuquerque, NM 87111. Dr. Vaughn's present address is Pittsburgh Veterinary Specialty and Emergency Center, 807 Camp Horne Rd, Pittsburgh, PA 15237.

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Address correspondence to Dr. Ward (dward@utk.edu).

men does not exist for use in dogs undergoing cataract surgery.[5–8,10–13,15–32] Inconsistency among variables recommended in treatment regimens include variations in drug or drugs prescribed and topical (frequency of administration and time of treatment initiation) versus systemic (dosage, route of administration, frequency of administration, and time of treatment initiation) administration.[5–8,10–13,15–32] Preoperative protocols differ widely among institutions and are often made on the basis of tradition or the individual surgeon's preference. Comparing one anti-inflammatory regimen to another by use of clinical indicators alone can be challenging because descriptive criteria (eg, aqueous humor flare and hyperemia) used to characterize uveitis are somewhat subjective. Anterior segment fluorophotometry, which measures the leakage of fluorescein into the anterior chamber following IV injection, has been found to be a sensitive means to quantify the breakdown of the blood-aqueous barrier in several species, including dogs.[33–38] The purpose of the study reported here was to compare postoperative intraocular inflammation after routine phacoemulsification between 2 preoperative anti-inflammatory regimens in dogs by use of both fluorophotometry and subjective grading of inflammation. We hypothesized that eyes treated with prednisolone acetate for 7 days prior to surgery would be significantly less inflamed after surgery than eyes treated with prednisolone acetate for only 1 day prior to surgery.

## Materials and Methods

**Animals—**Twenty-one dogs examined at the University of Tennessee College of Veterinary Medicine ophthalmology service for cataract evaluation and subsequently diagnosed with immature cataracts were randomly divided into 2 groups, with 10 dogs in group A and 11 dogs in group B. Randomization was achieved by use of a table of random numbers. Other than cataracts, all animals had normal results of routine preoperative screening, which consisted of a complete ophthalmic examination (including slit-lamp biomicroscopy, indirect ophthalmoscopy, Schirmer tear test measurement, and applanation tonometry), physical examination, ocular ultrasonography, electroretinography, CBC, serum biochemical analysis, and urinalysis. Dogs with diabetes mellitus were excluded from the study. In patients with bilateral cataracts, bilateral surgery was performed, but fluorophotometric evaluation of blood-aqueous barrier stability and subjective scoring of ocular inflammation were performed on only 1 eye, which was chosen randomly by use of a table of random numbers. All aspects of this study were approved by the University of Tennessee Institutional Animal Care and Use Committee. Signed informed consent was obtained from all owners.

**Premedication regimens—**All treatments were applied to both eyes in patients with bilateral disease undergoing surgery on both eyes, but were applied to only 1 eye in dogs undergoing unilateral surgery. Dogs in group A received 1 drop of 1% prednisolone acetate[a] topically 3 times daily beginning 7 days prior to surgery. Dogs in group B received 1 drop of artificial tear solution[b] (as a control) topically 3 times daily beginning 7 days prior to surgery. Prednisolone acetate and artificial tears were packaged in identical opaque bottles, and all investigators and owners were masked with respect to eye drops and groups. Because presurgical eye drops were administered at home by the owners, the investigators remained masked to the treatments administered despite the difference in appearance of the prednisolone acetate suspension (which is white) and artificial tear solution (which is clear). On the evening prior to surgery and the morning of surgery, dogs in both groups received identical treatments, which consisted of 1% prednisolone acetate, triple antibiotic solution, 1% tropicamide, and 2.5% phenylephrine topically 3 times on the evening prior to surgery and 4 times on the morning of surgery. Dogs in both groups also received 0.03% flurbiprofen topically 4 times on the morning of surgery, carprofen (2.2 mg/kg [1.0 mg/lb], SC) 2 hours prior to surgery, and cefazolin sodium (22 mg/kg [10 mg/lb], IV) approximately 1 hour prior to surgery. Cefazolin was readministered every 90 minutes throughout surgery. This preoperative regimen is the protocol routinely followed at our hospital for patients undergoing phacoemulsification surgery.

**Cataract surgery—**Anesthetic protocols were tailored for each individual patient, but in most instances consisted of placement of an IV catheter and premedication with an acepromazine, opiate, and anticholinergic combination administered IM 30 minutes prior to IV induction of anesthesia with propofol, placement of an endotracheal tube, and maintenance of anesthesia with inhalation of isoflurane in oxygen. Routine 2-handed phacoemulsification[c] via dorsal clear corneal incision was performed in all dogs. Hyaluronic acid was used as the ophthalmic viscosurgical device in all patients and was completely removed at the conclusion of surgery in all patients. Polymethylmethacrylate intraocular lenses[d] were placed routinely whenever possible. Incisions were closed with 8-0 polyglactin 910 in a simple continuous pattern. Surgeries were performed by 1 of 3 surgeons (DAW, DVHH, or RKV), who were masked to the eyes (right or left) to be assessed using fluorophotometry and to the group. As a result, each surgeon operated on the same number of right eyes as left eyes and operated on approximately the same number of dogs in group A as in group B. The same standard postoperative regimen was generally used in dogs of both groups and consisted of 1% prednisolone acetate, triple antibiotic solution, and artificial tear gel beginning immediately after surgery and continuing every 4 hours until the morning after surgery. At that time, treatment was reduced to 1% prednisolone acetate, triple antibiotic solution, and artificial tear gel every 6 hours and 1% tropicamide every 12 hours for the next 3 weeks. Three weeks after surgery, treatment changed to 1% prednisolone acetate every 8 to 12 hours and 1% tropicamide every 24 hours for the next 4 weeks, at which time medications were generally discontinued. Minor variations (eg, short-term application of IOP-lowering eye drops) to the postoperative regimen were made as deemed appropriate by the treating ophthalmologist.

**Assessment of blood-aqueous barrier disruption and inflammation—**On the day of the initial assessment, each dog was given 10% sodium fluorescein[e] (20 mg/kg [9.1 mg/lb], IV) between 1:00 PM and 3:00 PM. Approximately 60 minutes after fluorescein injection, anterior chamber fluorophotometry was performed with a computerized scanning ocular fluorophotometer fitted with an anterior chamber adapter.[f] For all anterior chamber fluorophotometry scans, dogs were given butorphanol tartrate (0.4 mg/kg [0.18 mg/lb], SC) 30 minutes prior to the scan to prevent emesis and provide mild sedation. Fluorophotometric scans were repeated 2 and 9 days after surgery. Blood-aqueous barrier disruption was quantified by comparing the amount of fluorescein leakage into the midcentral anterior chamber of the study eye before surgery with that 2 and 9 days after surgery, which was expressed as a percentage increase according to the following formula:

$$\%INC[Fl] = \left( \frac{[Fl]_{after\ surgery} - [Fl]_{before\ surgery}}{[Fl]_{before\ surgery}} \right) \cdot 100$$

where %INC[Fl] is the percentage increase in anterior chamber fluorescein concentration and [Fl] is the anterior chamber fluorescein concentration. Complete ophthalmic examinations were repeated 1 day, 9 days, 3 weeks, 7 weeks, 3 months, and 6 months after surgery. A subjective inflammation score from 0 to 8 was established by grading ocular redness and aqueous humor flare on a scale from 0 to 4 at each of these examinations and summing the scores for these 2 variables. The same investigator (NJM) performed each of these subjective evaluations.

**IOP measurements—**Intraocular pressure measurements were obtained 4 and 8 hours after surgery, with additional IOP measurements as deemed necessary. Treatment was instituted with a topical solution[g] of 2% dorzolamide and 0.5% timolol if IOP exceeded 25 mm Hg, and 0.005% latanoprost[h] was added if the IOP did not decrease with the combined dorzolamide and timolol treatment. Intraocular pressures were also measured 1 day, 9 days, 3 weeks, 7 weeks, 3 months, and 6 months after surgery.

**Statistical analysis—**Normally distributed data are reported as mean ± SD, and nonnormally distributed data are reported as median and range. Values for %INC[Fl] 2 and 9 days after surgery were compared between groups A and B with a Student *t* test. Intraocular pressures at the preoperative and each postoperative examination were compared between groups A and B with a Student *t* test. The incidence of IOP exceeding 25 mm Hg during the first 24 hours after surgery was compared between the 2 groups by use of the Fisher exact test. Phacoemulsification times and subjective inflammation scores at the preoperative and each postoperative examination were compared between groups A and B with the Mann-Whitney rank sum test. Power was calculated assuming a 100% difference between groups and by use of the pooled SD.

## Results

Group A was comprised of 10 dogs and included 4 Boston Terriers and 1 each of the following breeds: Miniature Poodle, Standard Poodle, Miniature Schnauzer, Cocker Spaniel, Bichon Frise, and mixed. The median age and weight were 5 years (range, 3 to 11) and 8.98 kg (19.76 lb; range, 5.55 to 13.41 kg [12.21 to 29.50 lb]), respectively. There were 5 neutered males, 4 spayed females, and 1 sexually intact female. Eight animals in this group had bilateral surgery, and 2 had unilateral surgery. Eyes randomized for fluorophotometry included 5 left eyes and 5 right eyes. Group B was comprised of 11 dogs and included 2 each of Boston Terriers, Miniature Schnauzers, and Bichon Frises and 1 each of the following breeds: Miniature Poodle, Toy Poodle, Shih Tzu, Yorkshire Terrier, and mixed. The median age and weight were 5 years (range, 2 to 10 years) and 6.14 kg (13.51 lb; range, 3.23 to 9.09 kg [7.11 to 20.0 lb]), respectively. There was 1 neutered male and 10 spayed females. Six animals in this group had bilateral surgery, and 5 had unilateral surgery. Eyes randomized for fluorophotometry included 5 left eyes and 6 right eyes.

In most instances, surgery was accomplished without incident or major complications. One eye in a group B patient had an inadvertent posterior capsular tear that precluded insertion of an intraocular lens. The median effective phacoemulsification times were 1.82 minutes (range, 1.12 to 3.20 minutes) for group A, and 1.33 minutes (range, 0.63 to 7.52 minutes) for group B (*P* = 0.97). All dogs except 1 were cooperative enough for the fluorophotometric scans with minimal physical restraint, and smooth plateaus of anterior chamber fluorescein concentrations were easily obtained in most patients.[37]

The mean ± SD %INC[Fl] values 2 days after surgery were 458.2 ± 340.0% (n = 7) in group A and 293.8 ± 196.7% (10) in group B. These values were not significantly (*P* = 0.22; power = 0.81) different. In group A, the 2-day postoperative scans were not available for 3 dogs: 1 dog was too uncooperative to obtain an accurate scan, a technical malfunction occurred during the scan of a second dog, and a third dog had an unreadable scan because fluorescein concentrations exceeded the linear range of the fluorophotometer.[37] The 2-day postoperative scan from 1 dog in group B failed to save to the fluorophotometer's computer hard drive and was therefore unavailable for analysis.

The mean ± SD %INC[Fl] values 9 days after surgery were 281.3 ± 249.2% (n = 8) in group A and 220.7 ± 208.4% (11) in group B. These values were not significantly (*P* = 0.57; power = 0.60) different. Scans from the uncooperative dog and the dog with excessively high fluorescein concentrations in group A were not available for analysis. In all instances, subjective inflammation score data were still collected from dogs with missing fluorophotometric data.

Subjective inflammation scores were similar between the 2 groups at all time points except for the 6-month postoperative assessment, with group B scores being significantly lower at that point **(Figure 1)**. The primary differences in IOP were seen within 24 hours after surgery. Of the 10 dogs in group A, 6 experienced IOP increases of > 25 mm Hg, with 1 experiencing bilateral IOP elevation. Of the 11 dogs in group B, only 2 had similar pressure increases (*P* = 0.08). All patients with IOP elevation were treated with a single drop of the dorzolamide-timolol solution. This effectively low-

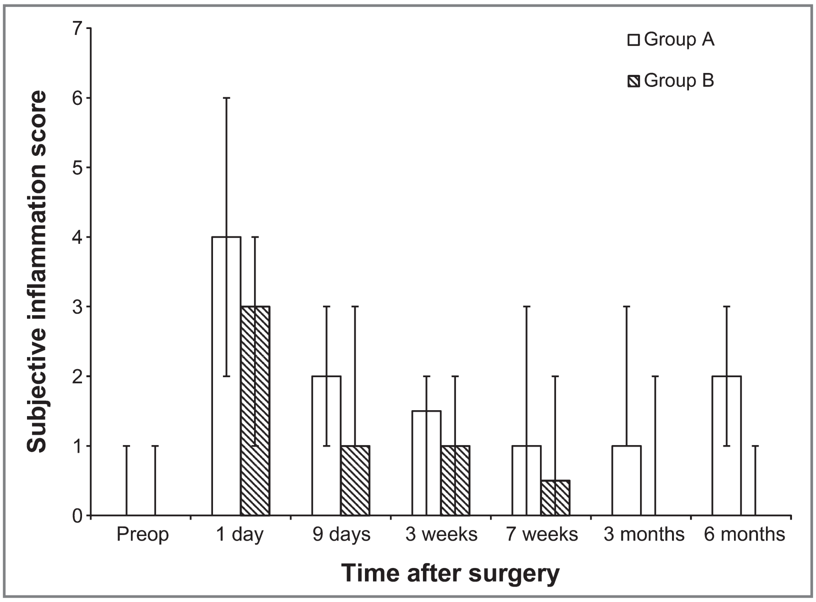


Figure 1—Median subjective inflammatory scores for dogs (n = 21) undergoing cataract surgery via phacoemulsification. Dogs were randomly divided into 2 groups. Group A (n = 10) dogs were topically treated with prednisolone acetate for 7 days prior to surgery, and group B (11) dogs were treated with prednisolone acetate commencing the evening prior to surgery. A subjective inflammation score from 0 to 8 was established by grading ocular redness and aqueous humor flare on a scale from 0 to 4 at examinations performed 1 day, 9 days, 3 weeks, 7 weeks, 3 months, and 6 months after surgery and summing the scores for these 2 variables. The same investigator (NJM) performed each of these subjective evaluations. Scores were not significantly different between groups except for the score at the 6-month postoperative visit, when the score was significantly (*P* = 0.012) lower for group B. Error bars denote the range. Preop = Preoperative.

ered IOP within 1 hour after administration in all but 2 patients, which required additional topical treatment with latanoprost to lower IOP. In all affected patients, IOP was back to normal by 24 hours after surgery, and patients did not require continued treatment after discharge. One dog in group B had an IOP of 24 mm Hg at the 9-day postoperative examination and was treated for approximately 8 weeks with the dorzolamide-timolol solution. From 1 day to 6 months after surgery, IOPs were < 25 mm Hg in all operated eyes at all recheck examinations. The only significant difference between IOPs at these examinations was at the 6-month follow-up when the IOPs in group B dogs (12.9 ± 2.64 mm Hg) were higher than IOPs in group A dogs (9.4 ± 1.95 mm Hg; *P* = 0.02). However, IOPs for both groups were well within the normal range. All eyes had visual function (on the basis of menace response and maze testing) at the end of the 6-month follow-up period.

## Discussion

The results of the present study indicate that in dogs undergoing cataract surgery via phacoemulsification, a full week of pretreatment with topical prednisolone acetate did not decrease postoperative inflammation, compared with commencement of topical prednisolone acetate treatment the evening prior to surgery, and was associated with a greater incidence of postoperative ocular hypertension. We used an objective measure of blood-aqueous barrier integrity, anterior chamber fluorophotometry, to demonstrate that 7 days of pretreatment with prednisolone acetate conferred no greater barrier-protective effect than simply beginning prednisolone acetate treatment the evening prior to surgery. Fluorescein administered IV enters normal eyes only to a limited extent.[36,37,39] Postsurgical uveitis leads to a breakdown in the blood-aqueous barrier, thereby permitting a higher concentration of fluorescein to enter the anterior chamber.[36,40,41] Thus, the %INC[Fl] before and after an insult can be used to assess the extent of blood-aqueous barrier breakdown. Fluorophotometry is a more sensitive and reliable indicator of blood-aqueous barrier breakdown than the measurement of aqueous humor proteins or clinical assessment alone.[34] Fluorophotometry is noninvasive and provides a means of evaluating the effectiveness of different pharmacological protocols at stabilizing the blood-aqueous barrier.[36,37,39]

In the present study, blood-aqueous barrier disruption was evident 2 days after surgery with a 293.8% to 458.2% increase in fluorescein concentrations in the anterior chamber compared with the preoperative levels in the 2 groups. The difference between the 2 groups was not significant, and the statistical power was high (0.81). By 9 days postoperatively, partial reestablishment of the blood-aqueous barrier was evident because fluorescein entry into the anterior chamber had decreased to 220.7% to 281.3% of the preoperative values in both groups. Again, the difference between the groups was not significant. The statistical power (0.60) was lower 9 days after surgery, indicating that a significant difference could have been present but that our sample size was too small to permit detection. However, group B had the smaller %INC[Fl], indicating that if this difference were significant, then a 7-day preoperative regimen of prednisolone had a deleterious effect on the integrity of the blood-aqueous barrier. Lacking a rational biological explanation for such a phenomenon, we suspect that a larger sample size would not substantiate this possibility.

The subjective assessments of inflammation paralleled the objective findings, with the only significant difference being a slightly smaller value in group B at the 6-month time point. Taken together, these data do not support the notion that extensive preoperative treatment with topical corticosteroids dampens the inflammatory response following cataract surgery. Additional studies to determine the effects of limiting pretreatment with topical corticosteroids to the morning of surgery or eliminating pretreatment entirely would be of interest.

Dogs that received a full week of topical prednisolone acetate prior to surgery in the present study had an increased incidence of postoperative ocular hypertension, compared with those receiving only 1 day of topical prednisolone acetate prior to surgery, which was an unexpected finding. However, because of the small number of patients (6/10 dogs in group A and 2 of 11 dogs in group B) that experienced this complication, along with the fact that our routine IOP measurements are made 4 and 8 hours after surgery, we cannot say for certain there was a direct causal relationship between the duration of pretreatment and IOP elevation or that IOP elevations did not occur at times prior to those measurements. Nonetheless, given the clinical relevance of postoperative IOP elevations and the potential impact on long-term outcome, these observations deserve further study. Topical corticosteroids have long been linked to elevations in IOP in humans[42,43] (especially those affected with primary open-angle glaucoma), rabbits,[44] and cats.[45] Long-term (ie, 6 months) use of topical 0.1% dexamethasone caused an elevation in IOP of 5.5 mm Hg in clinically normal dogs,[46] and a reversible increase in IOP was seen after 7 to 10 days of treatment in Beagles with primary open-angle glaucoma.[47] Conversely, oral hydrocortisone administration for 5 weeks did not elevate IOP in clinically normal dogs.[48] Corticosteroids induce mechanical and biochemical changes within the trabecular meshwork and increase IOP by increasing aqueous humor outflow resistance, perhaps through alterations in extracellular matrix components within the aqueous outflow pathway, inhibition of proteases and phagocytosis within the trabecular meshwork, and alterations in the morphology of the trabecular meshwork cells.[43,49,50] Because alterations in the trabecular meshwork would be expected to take time, it is perhaps not surprising that a longer course of topical corticosteroids prior to cataract surgery might reversibly alter the aqueous outflow pathway in some dogs, predisposing them to acute elevations in IOP following cataract surgery. Alterations within the trabecular meshwork referable to the longer course of corticosteroid treatment may have made dogs less able to compensate for common postoperative changes such as swelling of the iridiocorneal angle or accumulation of fibrin, cells, or debris within the trabecular meshwork. In addition, it has been shown that steroids reduce fibrinolytic activity in vitro,[51] and this could conceivably add to outflow resistance in the trabecular meshwork by increasing fibrin accumulation associated with postoperative uveitis.

The dogs in this study that developed postoperative ocular hypertension had modest elevations in IOP, and in all patients, the pressure decreased immediately following the administration of topical glaucoma medications. In all patients, IOP had returned to levels considered normal by 24 hours after surgery. It is not known with certainty whether such short-term IOP elevations following cataract surgery have lasting effects on visual acuity in dogs. In humans, it appears that most patients with normal optic nerves can tolerate IOP elevations in the first 24 hours after cataract surgery with few noticeable effects, although subsets of patients at risk for optic neuropathies fare more poorly.[52,53] In dogs, alterations in oscillatory potentials and electroretinographic amplitudes and latencies were seen with experimental IOP elevations of 30% to 300% for as little as 3 to 5 minutes.[54] These changes reversed with normalization of IOP, but the lasting functional effects on vision were not investigated. Because postoperative ocular hypertension has the potential to be very severe and can lead to permanent blindness through injury to the optic nerve and retina,[55,56] it would seem prudent to err on the side of avoiding IOP spikes until further clinical data indicate such prudence is unwarranted. To that end, our data suggest it is unwise to pretreat dogs undergoing routine cataract surgery with topical steroids for more than 1 day. Additionally, topical corticosteroid administration is not without systemic risks, including alterations in hepatic structure and function, alterations in blood glucose metabolism, and suppression of the hypothalamic-pituitary-adrenocortical axis.[57–60] Thus, treating dogs for an unnecessary duration of time prior to cataract surgery may be detrimental to both systemic and ocular health. It is important to emphasize that we limited our study to dogs with immature cataracts that were otherwise normal on preoperative ocular examination. Dogs at risk for more severe postoperative inflammation, such as those with advanced hypermature cataracts or preexisting lens-induced uveitis, may still benefit from a more extensive course of preoperative anti-inflammatory treatment.

Our study design, which used 3 surgeons, can be viewed as a limitation or an advantage. The use of multiple surgeons could induce bias on the basis of differences in surgical experience and skill, which could influence the degree of postoperative inflammation. However, the study eyes were blocked by surgeon, so these factors should not affect one group to a greater extent than the other. Conversely, by intentionally including multiple surgeons, experimental results are more likely to be applicable to a wider range of clinical cases. Both approaches have been used in previous studies[2,13,32] of cataract surgery in dogs. In addition, several of the dogs in this study received latanoprost or a combination of 2% dorzolamide and 0.5% timolol on the evening of surgery, which raises the concern that these drugs could affect the permeability of the blood-aqueous barrier and alter the fluorophotometry results. However, a previous study[61] showed that neither of these drugs has a substantial effect on the blood-aqueous barrier as assessed with fluorophotometry.

a. Prednisolone acetate suspension 1%, Alcon Laboratories Inc, Fort Worth, Tex.
b. Akwa tears lubricant eye drops, Akorn Inc, Lake Forest, Ill.
c. AMO Diplomax, Allergan, Irvine, Calif.
d. Ocularvision Inc, Solvang, Calif.
e. AK-FLUOR, Akorn Inc, Lake Forest, Ill.
f. Fluorotron Master, Coherent Radiation Inc, Palo Alto, Calif.
g. CoSopt, Merck & Co, Whitehorse Station, NJ.
h. Xalatan, Cardinal Health, Woodstock, Ill.

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**From this month's *AJVR***

## Influence of exercise on the distribution of technetium Tc 99m medronate following intra-articular injection in horses

Jennifer A. Dulin et al

**Objective**—To determine the effects of exercise on the distribution and pharmacokinetics of technetium Tc 99m medronate ($^{99m}$Tc-MDP) following intra-articular (IA) injection in horses.

**Animals**—5 horses.

**Procedures**—1 antebrachiocarpal joint (ACJ)/horse was assigned to the exercised group (n = 5), and the contralateral ACJ was evaluated in the nonexercised group (5) after a minimum washout period of 7 days. Following IA injection of $^{99m}$Tc-MDP (148 MBq), blood and scintigraphic images of the carpus were obtained at 5, 10, 15, 20, 25, 30, 45, 60, 90, 120, 240, 360, 480, 600, 720, and 1,440 minutes. Plasma and scintigraphic radioactivity were determined over time, and pharmacokinetic parameters were generated via noncompartmental and compartmental analyses. Each horse was monitored via physical and lameness examination and ACJ synovial fluid analysis before injection and at days 1, 2, 3, and 7.

**Results**—Lameness was not observed. Mean ± SD synovial fluid WBC count increased at day 1 (exercised, 721 ± 234 cells/µL; nonexercised, 948 ± 223 cells/µL), but returned to baseline at days 3 and 7. Mean time to maximum plasma radioactivity was earlier in the exercised group (16.00 ± 2.35 minutes) than the nonexercised group (43.75 ± 3.64 minutes). Linear regression of the scintigraphic radioactivity-time curves revealed a greater negative slope in the exercised group within the first 25 minutes. There was no difference in absorption or elimination rate constants in a 2-compartment model.

**Conclusions and Clinical Relevance**—IA injection of $^{99m}$Tc-MDP was safe and effective for evaluating synovial solute distribution. Exercise significantly increased early transfer of $^{99m}$Tc-MDP from the ACJ into plasma, although absorption and elimination rate constants were not affected. Exercise may affect synovial clearance and withdrawal times of medications administered IA. (*Am J Vet Res* 2012;73:418–425)


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