Rigid urethrocystoscopy via a percutaneous fluoroscopic-assisted perineal approach in male dogs: 19 cases (2005–2014)

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OBJECTIVE
To describe the technique and outcome for male dogs undergoing rigid urethrocystoscopy via a novel percutaneous, fluoroscopic-assisted perineal approach.

DESIGN
Retrospective case series.

ANIMALS
19 client-owned male dogs.

PROCEDURES
Medical records of male dogs that underwent urethrocystoscopy via a percutaneous perineal approach for treatment of a variety of conditions from 2005 through 2014 were reviewed. Signalment, history, pertinent diagnostic imaging results, endourologic and postprocedure details, duration of hospitalization, complications, and outcome (short-term, < 1 month; long-term, ≥ 1 month) were recorded. After flexible urethrocystoscopy, direct percutaneous perineal needle puncture and guidewire placement by means of fluoroscopic guidance (with or without ultrasonography) allowed access to the urethral lumen. The perineal tract was subsequently serially dilated to accommodate a peel-away sheath and rigid endoscope. Rigid urethrocystoscopy was performed, and on completion of endourologic procedures, the access site was left to heal by second intention.

RESULTS
19 male dogs successfully underwent 20 procedures. No intraoperative complications were reported. Short-term outcome was good (ie, mild peri-neal urine leakage) for 3 dogs and excellent (ie, no abnormalities with urination) for 16. Long-term outcome was excellent for the 17 dogs for which follow-up information was available.

CONCLUSIONS AND CLINICAL RELEVANCE
A percutaneous fluoroscopic-assisted perineal approach (with or without ultrasonography) allowed access to the pelvic urethra with no major complications in the present series of patients. This minimally invasive approach may be a valuable tool for endourologic procedures in male dogs. (J Am Vet Med Assoc 2016;249:918–925)

Endourology, the diagnosis and treatment of urogenital tract disease by means of fluoroscopy, ultrasonography, various flexible and rigid endoscopes, assorted retrieval and biopsy devices, intracorporeal lithotripters and lasers, guidewires, catheters, and stents, has been a rapidly growing field for management of small animal patients over the past decade.1–3 Conditions treated include benign and malignant urethral and ureteral obstructions, ectopic ureters, idiopathic renal hematuria, and urolithiasis.1,2 Rigid and flexible endoscopes of various lengths and diameters are available. Flexible ureteroscopes (7.5F to 8.5F outer diameter with 3.6F inner working channel) designed for use in human patients are commonly used for urethrocystoscopy in male dogs.3–5 However, these endoscopes are limited in imaging and procedural capabilities because of the fiberoptic technology, diminished illumination, difficult angle deflection, and small working channel. In contrast, rigid endoscopes provide well-illuminated and highly detailed images with rod-lens system technology. The angled lens of these rigid endoscopes also provides an expansive field of view, and the rigidity facilitates examination of structures throughout the lower urinary tract. Furthermore, the larger accompanying working channel (typically 5F) allows for better suction and irrigation and accommodates a variety of instrumentation, which in turn enhances the procedural capabilities of rigid endoscopes. Whereas rigid endoscopes have their obvious benefits, retrograde rigid urethrocytoscopy has typically been limited to female dogs because of the long, narrow, and curved male urethra. This difference in anatomy limits the use of rigid endoscopes in male dogs, generally necessitating flexible endoscopes.3
Materials and Methods

Case selection criteria

Medical records of male dogs evaluated by the Interventional Radiology and Interventional Endoscopy Service of the Matthew J. Ryan Veterinary Hospital of the University of Pennsylvania from January 1, 2005, through August 31, 2009, or the Interventional Radiology and Endoscopy Service of the Animal Medical Center, New York, from September 1, 2009, through September 1, 2014, that underwent any endourologic procedure during which perineal access to the pelvic urethra was attempted for rigid urethrocystoscopy were reviewed. These dates corresponded to the authors’ (CW and ACB) locations of employment during the given time periods. Dogs were included in the study if a procedural report and follow-up information were available for review. Patients for which the medical record was incomplete or for which no follow-up information was available after hospital discharge were excluded.

Medical records review

Information regarding patient history, signalment, comorbidities, pertinent diagnostic imaging results (ie, abdominal ultrasonography, contrast urethrocystography, and flexible and rigid urethrocystoscopy), details of endourologic procedures (including number of access attempts, urethral access procedure time, instruments used, placement of postoperative urinary catheter [yes vs no], and primary surgeon), duration of hospitalization, details of postoperative care, follow-up diagnostic procedures (if applicable), complications (if applicable), and outcome was recorded. If a patient did not have a follow-up hospital visit, follow-up information was obtained via communication with the owner or referring veterinarian. The specific timing of follow-up examinations varied and was dependent on clinician preference and the primary condition treated.

Follow-up information was limited to details related to the perineal access site; information associated with the underlying urologic condition was considered beyond the scope of this study. Outcome was subjectively described as excellent, good, or poor. Outcome was described as excellent when the dog had apparent complete healing of the access site and no abnormalities when urinating. Outcome was described as good when the dog had apparent complete healing of the access site, abnormal urination, or both but did not require medical or surgical intervention. Outcome was described as poor when a dog had abnormal healing of the access site, abnormal urination, or both that required surgical intervention. Both short-term (< 1 month) and long-term (≥ 1 month) outcomes were recorded.

Procedures

Following induction of general anesthesia, the perineal approach was performed with the patient positioned in dorsal recumbency and the hind limbs secured cranially (Figure 1). The prepuc and perineal areas were clipped of hair and aseptically prepared and draped by means of standard technique. A purse-string suture was placed in the anus to avoid intraoperative contamination. A 2.8-mm flexible ureteroscope was then introduced for initial evaluation of the lower urinary tract prior to perineal access. After this evaluation, urethral access was facilitated with urethral distension achieved by introduction of either a red rubber catheter or a Foley catheter (Figure 2).
For the former, a red rubber catheter was introduced in retrograde fashion into the urethra and bladder. The bladder was filled with a 50:50 mixture of iohexol and saline (0.9% NaCl) solution. The red rubber catheter was then withdrawn to the level of the penile urethra, and the urethra was distended by means of injection of the dilute iohexol solution with manual pressure applied to the bladder. Then with fluoroscopic and, subsequently, additional ultrasonographic assistance, the lumen of the distended pelvic urethra was accessed via percutaneous 18-gauge needle puncture. Alternatively, an appropriately sized Foley catheter was introduced. Distension of the low-pressure Foley catheter balloon at the level of the intrapelvic urethra facilitated distension of the urethra and produced a larger, more visible target for percutaneous needle puncture. Visualization of the Foley balloon by means of fluoroscopy and ultrasonography allowed for direct percutaneous puncture for the latter case. Figure 2—Representative images obtained during rigid urethrocystoscopy by means of a percutaneous fluoroscopic-assisted perineal approach in male dogs. A—A lateral positive contrast urethrogram of a patient with a distended urethra (white arrow) after percutaneous access with an 18-gauge needle (black arrow). B—A lateral positive contrast urethrogram of a dog with a subjectively narrow urethra (white arrow), resulting in difficulty maintaining urethral distension. The needle cannula is visible in the urethra (black arrow) with contrast extravasation. Urethral access was unsuccessful during this attempt. C—Ultrasoundographic image of the dog in panel B with a contrast-filled Foley catheter balloon in place (arrow). D—Fluoroscopic image of the dog in panel B. With a contrast-filled Foley catheter balloon (white arrow) as a target, ultrasonographic and fluoroscopic guidance facilitated needle access (black arrow) into the distended urethra. E—Ultrasoundographic image of the patient in panel B demonstrating rupture of the Foley balloon after needle penetration. F—Fluoroscopic image of the patient in panel B after rupture of the Foley balloon. A guidewire (white arrow) was advanced into the urethra and bladder via the needle cannula (black arrow). Access was successfully achieved during this attempt.
of the balloon with the needle. Urethral luminal access was confirmed after the needle ruptured the balloon.

For both techniques, a C-arm fluoroscopy unit was positioned transversely across the patient to project a lateral image. A 4- to 5-mm-long vertical perineal midline stab incision was made at the level of the ischium. An 18-gauge renal puncture needle was placed with fluoroscopic guidance into the perineum and advanced into the pelvic urethra as described (Figure 3). For many patients in this series, ultrasonography was used in conjunction with fluoroscopy to produce an orthogonal view that helped facilitate accurate needle placement. The sharp stylet was removed from the renal puncture needle and access was confirmed with return of urine. Next, a 0.035-inch angled hydrophilic guidewire was advanced and coiled into the urinary bladder under fluoroscopic guidance. The C-arm was then rotated into a dorsoventral projection. The 18-gauge renal puncture needle catheter sleeve was advanced over the wire and into the prostatic urethra. The hydrophilic guidewire was exchanged for a 0.035-inch superstiff guidewire and the 18-gauge catheter was removed over the wire. Serial vessel dilators (4F, 8F, 12F, and 16F) were used to dilate the tract to accept either a 14F or 16F peel-away introducer sheath. Typically, considerable pressure was necessary to advance the dilators and stretch the bulbospongious and corpus cavernosus tissues. Once the sheath was within the mid-portion of the pelvic urethra, the dilator was removed and the peel-away sheath was secured to the skin with 3-0 nylon suture material. A 2.7-mm rigid endoscope was then advanced through the sheath and rigid urethrocytoscopies performed. On completion of the various endourologic procedures, the endoscope and sheath were removed and the site was allowed to heal by second intention. On occasion, a nonadherent dressing was placed over the perineal access site. Some patients also had a urinary catheter placed, depending on clinician preference.

After March 2013, slight modifications to the original procedure were made. The Foley urinary catheter technique (vs the red rubber catheter technique) was used exclusively thereafter. In addition, after November 2013, disposable trocar needles were used instead of renal puncture needles. The trocar needles enhanced ultrasonographic identification of the needle tip during the procedure. All other procedures were performed as described.

Postprocedure care

During recovery, dogs received analgesics, including buprenorphine (0.01 mg/kg [0.0045 mg/lb], IV, q 4 to 6 h) during hospitalization and tramadol (2 to 4 mg/kg [0.9 to 1.8 mg/lb], PO, q 8 to 12 h) for 1 to 5 days as needed after discharge. In addition, typically either amoxicillin-clavulanic acid (13 to 18 mg/kg [5.9 to 8.2 mg/lb], PO, q 12 h for 5 to 14 days) or enrofloxacin (6.8 to 14 mg/kg [3.1 to 6.4 mg/lb], PO, q 24 h for 7 to 90 days) was also prescribed. Antibacterials and other medications were usually prescribed as part of the treatment for the endourologic procedure or for concurrent management of pre-existing conditions (eg, urinary tract infection, pyelonephritis, hematuria, and cystic calculi) depending on clinician preference, versus being indicated for the perineal urethral access procedure. Owners were instructed to keep the perineal access site clean and to monitor daily for swelling, discharge, signs of irritation, urine leakage, or any combination of these signs.

Results

Clinical data

Nineteen male dogs (4 sexually intact and 15 neutered) met the study inclusion criteria. There were a total of 20 endourologic procedures (1 dog had 2 procedures) for various urologic conditions including ureteral ectopia, obstructive ureteroliths, idiopathic re-

Figure 3—Representative images obtained during rigid ure throcytoscopies of male dogs by means of a percutaneous fluoroscopic-assisted perineal approach and at the time of follow-up examinations. A—A C-arm fluoroscopy unit positioned laterally for image acquisition during needle placement. B—Rigid urethrocytoscopies performed via an introducer sheath after urethral access has been obtained. C—Photograph of the perineal surgical site in a dog immediately following the procedure. D—Photograph of the perineal surgical site in a dog at the time of a 3-month follow-up visit.
nal hematuria, septic ureterocele, and intravesicular mucosal hemorrhage. Median age was 4.6 years (range, 0.4 to 12.5 years), and median weight was 27 kg (59.4 lb; range, 8.7 to 57.1 kg [19.1 to 125.6 lb]). There were 8 Labrador Retrievers, 3 mixed-breed dogs, 2 Standard Poodles, and 1 each of Entlebucher Mountain Dog, Australian Shepherd, English Bulldog, Soft Coated Wheaten Terrier, Boxer, and Newfoundland. Concurrent medical problems included cystic calculi (n = 2); recurrent urinary tract infections (2); hypothyroidism (2); International Renal Interest Society stage III chronic kidney disease (1); microphthalmia (1); generalized demodicosis (1); inflammatory bowel disease (1); arrhythmogenic right ventricular cardiomyopathy (1); recurrent grade II mast cell tumor, an adrenal mass, and nonspecific hepatopathy (1); splenic nodular hyperplasia, renal corticomedulary nodule, hepatic cirrhosis, prostatomegaly, and keratoconjunctivitis sicca (1); and chronic pancreatitis and diabetes mellitus (1).

Procedures
Perineal urethral access was performed by one of the authors (CW or ACB) who developed the technique in all 19 patients. Seventeen of the 19 dogs had apparently normally urethras on the basis of examination via flexible urethrocystoscopy prior to conversion to rigid urethrocystoscopy by means of the perineal approach. One dog had a prostatic urethra that appeared mildly irregular in contour with small focal areas of mineralization. This dog had prostatomegaly of unknown etiology. Another dog underwent 2 separate procedures at a 3-month interval as part of treatment for idiopathic renal hematuria. For both procedures, flexible urethrocystoscopy was performed prior to conversion to rigid urethrocystoscopy via a perineal approach. On initial examination, the urethra in this dog appeared normal. However, when this dog was reexamined, a mildly irregularly appearing urethral lumen at the level of the previous urethral access site was evident on a cystourethrogram (Figure 4).

For 9 of the 19 dogs (September 2008 to October 2012), perineal urethral access was obtained as described with a red rubber catheter. Subsequent dogs treated after March 2013 had urethral access obtained via direct percutaneous puncture of an inflated Foley catheter balloon under fluoroscopic and ultrasonographic guidance (Figure 2). Additionally, in 5 dogs evaluated after November 2013, a trocar needle instead of the original renal puncture needle was used.

Rigid urethrocystoscopy was performed successfully in all 19 dogs. The procedure time to complete urethral access was recorded for 11 of 19 dogs. Median procedure time was 11 minutes (range, 5 to 34 minutes). The number of attempts required to gain access to the urethra was recorded for 8 of 19 dogs. Median number of attempts was 2 (range, 1 to 5). Once access with rigid cystoscopy was established, endourologic procedures included bilateral (n = 7) and unilateral (3) cystoscopic-guided laser ablation of ectopic ureters, bilateral (2) and unilateral (5) endoscopic-guided renal sclerotherapy for idiopathic renal hematuria, bilateral (2) and unilateral (5) ureteral stent placement, septic ureterocele ablation (1), and laser cauterezation of intravesicular mucosal hemorrhage (1). Seven of 19 dogs had multiple procedures performed. One of 19 dogs was also castrated. There were no intraoperative complications associated with the perineal approach and rigid urethrocystoscopy.

All dogs recovered from anesthesia uneventfully. Three of 19 dogs had urinary catheters placed postoperatively; urinary catheters were kept in place for a median duration of 12 hours (range, 3 to 18 hours). No complications developed in these dogs. Eleven of 19 dogs were managed as outpatients, 8 of 19 dogs were hospitalized overnight and discharged the next day; and 1 dog was hospitalized for 2 days.

Follow-up and outcomes
Median follow-up time was 268 days (range, 4 to 1,248 days). No dogs were lost to short-term follow-up. In the short term, 16 of the 19 dogs had excellent outcomes and 3 had good outcomes. There were no dogs with poor outcomes. The 3 dogs considered to have good outcomes had minor leakages of urine via the perineal access site during voluntary urination for up to 48 hours after their procedures. One dog had 1 episode of urine leakage during hospitalization, with no further problems noted. The other 2 dogs both had multiple episodes of urine leakage that spontaneously resolved within 48 hours according to the owners. Two dogs classified as having excellent outcomes had minor postoperative concerns that did not require intervention. One dog had mild stranguria postoperatively that resolved within 24 hours. The second dog had signs of mild perineal irrita-
tion, likely secondary to preprocedural clipping. This irritation resolved within a few days according to the owner. No other complications were noted. Seventeen dogs had long-term follow-up information available. An excellent outcome was recorded for all 17 dogs with no known complications associated with healing of the perineal access site. Two dogs that had excellent outcomes on long-term follow-up were originally categorized as good outcomes on short-term follow-up. Two dogs were not available for long-term follow-up.

Four of 19 dogs underwent follow-up diagnostic evaluation of the urethra. One dog underwent contrast urethrocystography only, 1 dog underwent urethrocystoscopy only, and 2 dogs underwent both contrast urethrocystography and urethrocystoscopy. The 1 dog (a 13-year-old castrated male Labrador Retriever) that had 2 procedures performed 3 months apart appeared to have a mild urethral abnormality on the second contrast urethrocystogram (Figure 3). This dog did not have any lower urinary tract signs. The remaining 3 dogs had apparently normal urethras when reevaluated 2 (n = 2) and 6 (1) months after the procedure.

At the time of final follow-up, 5 of 19 dogs had died or been euthanized as a result of disease unrelated to perineal urethral access. One dog (a 13-year-old castrated male Labrador Retriever) was euthanized because of recurrent mast cell tumors 7 months after undergoing bilateral sclerotherapy. One dog (an 11-year-old castrated male Standard Poodle) was euthanized because of diffuse, severe hepatic fibrosis and cirrhosis and splenic hemangiosarcoma 4 days after undergoing unilateral sclerotherapy. One dog (a 2-year-old sexually intact male Labrador Retriever) was euthanized because of progressive chronic kidney disease 9 months after undergoing bilateral cystoscopic-guided laser ablation of ectopic ureters. Records on the reasons for euthanasia were not available for one dog (a 9-year-old castrated male English Bulldog). According to the referring veterinarian, 1 dog (a 9-year-old castrated male mixed-breed dog) was euthanized because of an esophageal stricture 2 weeks after undergoing unilateral sclerotherapy.

Discussion

Results of the present small retrospective case series conducted over a 9-year period suggested that the percutaneous fluoroscopic-assisted perineal approach is a feasible option for rigid urethrocystoscopy, facilitating a variety of minimally invasive endourologic procedures in male dogs. Whereas flexible urethrocystoscopy has been extensively used in male dogs because of their urethral anatomy, it can limit visualization, procedural dexterity, biopsy acquisition, and the ability to access the ureterovesicular junction. Therefore, male dogs undergoing endourologic procedures such as ureteral stent placement, cystoscopic-guided laser ablation, renal sclerotherapy, and urinary bladder biopsy may benefit from the use of a rigid endoscope. Previous reports have described perineal approaches for rigid cystoscopy in male dogs. To our knowledge, Brearley et al. were the first to describe the technique of rigid urethrocystoscopy in clinically normal male dogs, with the urethral lumen accessed via a perineal skin incision, surgical dissection, and needle puncture of the pelvic urethra. Brearley et al. reported rigid urethrocystoscopy with the resultant incisions left to heal by second intention. No major complications were encountered and all dogs were clinically normal 7 days after surgery. Furthermore, postmortem examination did not reveal any urethral abnormalities.

As flexible endoscopes have become widely available, the surgical perineal approach for male dogs has been largely abandoned in favor of less invasive methods. We suggest that it may be the perceived potential need for subsequent surgery and the attendant risks of hemorrhage, urine leakage, and urethral stricture that have encouraged clinicians to perform flexible urethrocystoscopy. The fluoroscopic- and ultrasonographic-assisted perineal approach to the urethra described in the present report is a minimally invasive approach that does not require a surgical approach, dissection, or incision into the urethra. Whereas to our knowledge there are no studies directly comparing an open approach with a percutaneous approach such as described here, it would seem intuitive that less tissue dissection and manipulation would result in decreased postoperative morbidity.

Hemorrhage is an established potential complication of urethral surgery because of the vascularity of the corpus spongiosum, but was not reported for any of the patients in the present study. We suspect that hemorrhage was minimal because direct needle puncture with subsequent dilation of the tissues resulted in less tissue trauma than the sharp dissection that occurs during open urethral surgery.

Urinary catheters were placed postoperatively in only 3 of 19 dogs in this series. The placement of a urinary catheter in the 3 early patients was mainly a result of surgeon preference and a lack of information on potential procedure-related complications. All urinary catheters were removed within 18 hours after placement, and no complications were noted with the catheters in place or after the catheters were removed. We elected not to place urinary catheters in the 16 patients treated after February 2011 because of suspected low risk for complications and because even unsutured pre-scrctal urethrotomies can heal uneventfully without urinary diversion.

Urine leakage from the perineal access site was noted in 3 dogs in the present series. All urine leakage resolved within 48 hours without any need for intervention. We suspect that the urethral access sites healed rapidly because of the very small de-
fent created and the known rapid healing of the urethral mucosa.\textsuperscript{11} Results of the present study suggested that the small defect does not need to be closed primarily and the access site may be allowed to heal by second intention without undue risk of complications.

None of the dogs in the present study were suspected to develop urethral strictures. However, only 4 of 19 dogs underwent repeated diagnostic imaging. One dog (reevaluated 3 months after treatment) was found to have a urethra that appeared mildly abnormal for unknown reasons. There was no obvious stricture and there were no lower urinary tract signs. We suspected that the filling defect may have represented areas of mucosal or submucosal fibrous tissue, as has been documented in dogs after prescrotal urethrotomy.\textsuperscript{12} The other 3 dogs that were reevaluated had apparently normal urethras on diagnostic imaging. The remaining 15 dogs did not undergo repeated diagnostic imaging because they were not reexamined for clinical signs suggestive of lower urinary tract disease. It is possible that urethral strictures occurred in some of these dogs but remained undiagnosed. Layton et al\textsuperscript{14} reported that urethral narrowing may need to exceed 60% of the urethral diameter before clinical signs become evident. As such, strictures < 60% could have developed in some dogs of this series but without clinical signs, and these dogs did not undergo repeated evaluation. In addition, it is also possible that the follow-up period may have been too short to allow clinical signs of stricture formation to develop. However, with a long-term median follow-up time of 268 days (range, 4 to 1,248 days), we would expect that signs of urethral strictures would have been evident.

Limitations of the present study included the small number of cases, retrospective nature, lack of follow-up diagnostic evaluation in most dogs, and subjective grading of outcome. Because this was a retrospective study, there could not be complete standardization of the procedure. There were minor changes in the procedure toward the latter half of the study that we believed would simplify access to the pelvic urethra and perhaps decrease procedure time (eg, use of a Foley catheter to facilitate urethral access). Additionally, complete medical records were not always available, such that the procedure time and number of access attempts were recorded in 11 of 19 and 8 of 19 dogs, respectively. Furthermore, only 4 of 19 dogs underwent follow-up diagnostic imaging. Although we do not believe there were any major postoperative urethral abnormalities, it is difficult to make assumptions on the basis of such a small sample size. Lastly, clinical outcomes were graded subjectively on the basis of review of medical records and communication with referring veterinarians and owners. It is possible that bias, owner and veterinarian recall, and variable perception of healing could have affected the assessment of outcome.

Rigid urethrocystoscopy by means of a percutaneous fluoroscopic-assisted perineal approach may be a feasible minimally invasive technique for access to the pelvic urethra in male dogs, facilitating endourologic treatment of a variety of conditions.

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Footnotes


b. Flex-X\textsuperscript{2}, 2.8-mm, Karl Storz Endoscopy America Inc, Culver City, Calif.

c. Omnipaque (iodixir, 240 mg/mL), GE Healthcare, Princeton, NY.

d. Artis Zee Fluoroscopic C-arm, Siemens, Malvern, Pa.

e. 18-Gauge renal puncture needle set, Cook Medical, Bloomington, Ind.

f. Weasel wire, Infiniti Medical, Menlo Park, Calif.

g. Amplatz Super stiff guide wire, Boston Scientific Corp, Natick, Mass.

h. Vessel dilators, Infiniti Medical, Menlo Park, Calif.

i. 14 and 16 F peel-away introducer sheaths, Cook Medical, Bloomington, Ind.

j. Rigid endoscope, 2.7-mm 30° lens, Richard Wolf, Vernon Hills, Ill.

k. Rigid endoscope, 2.7-mm 30° lens, Karl Storz Endoscopy America Inc, Culver City, Calif.

l. Tegaderm, 3M, Saint Paul, Minn.

m. EchoTip Trocar Needle, Cook Medical, Bloomington, Ind.

References


Effects of topical ocular application of 1% trifluridine ophthalmic solution in dogs with experimentally induced recurrent ocular canine herpesvirus-1 infection
Chloe B. Spertus et al

OBJECTIVE
To determine the effects of topical ocular application of 1% trifluridine ophthalmic solution in dogs with experimentally induced recurrent ocular canine herpesvirus-1 (CHV-1) infection.

ANIMALS
10 specific pathogen-free Beagles.

PROCEDURES
12 months prior to the beginning of the randomized, masked, placebo-controlled 30-day trial, latent ocular CHV-1 infection was experimentally induced in each dog by topical ocular inoculation of both eyes with a field strain of CHV-1. Recurrent ocular CHV-1 infection was induced by oral administration of prednisolone for 7 days (starting day 1). Starting on the fourth day of prednisolone administration, each dog received 1% trifluridine solution or artificial tears (placebo) topically in both eyes 6 times daily for 2 days and then 4 times daily for 12 days. Ophthalmic examinations were performed every 2 days, and ocular disease scores were calculated. Ocular samples for CHV-1 PCR assays and blood samples for clinicopathologic analyses and assessment of CHV-1 serum neutralization antibody titers were collected at predetermined intervals.

RESULTS
Conjunctivitis was clinically detected in all dogs by day 4. Compared with dogs receiving placebo, mean and total clinical ocular disease scores were significantly lower and median CHV-1 shedding duration was significantly shorter for the trifluridine-treated dogs. Both groups had increasing CHV-1 serum neutralization antibody titers over time, but no significant differences between groups were detected. Clinicopathologic findings were unremarkable throughout the study.

CONCLUSIONS AND CLINICAL RELEVANCE
Topical ocular application of 1% trifluridine ophthalmic solution was well tolerated and effective at reducing disease scores and viral shedding duration in dogs with experimentally induced ocular CHV-1 infection, but may require frequent administration. (Am J Vet Res 2016;77:1140–1147)