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Objective—To describe and evaluate the outcome of cystoscopic-guided laser ablation of intramural ureteral ectopia in male dogs.

Design—Retrospective case series.

Animals—4 incontinent male dogs with intramural ureteral ectopia.

Procedures—Intramural ectopic ureters were diagnosed via preoperative computed tomography–IV urography and subsequent cystoscopy. Transurethral cystoscopic-guided laser ablation (diode laser [n = 3 dogs] and holmium:yttrium aluminum garnet laser [1]) was performed to proximally relocate the ectopic ureteral orifice to the urinary bladder. Fluoroscopy was used during the procedures to confirm that the ureteral tract was intramural and the ureteral orifice was intravesical after the procedure. In 1 dog with bilateral ureteral ectopia, staged laser ablation was performed at 6-week intervals because of difficulty viewing the second ureter on the first attempt. All ureteral orifices were initially located in the middle to proximal portion of the prostatic portion of the urethra. Six weeks after surgery, imaging was repeated in 3 of 4 dogs.

Results—Postoperative dysuria or hematuria did not develop. All dogs were immediately continent after laser treatment and remained so at a median follow-up period of 18 months (range, 15 to 20 months) without medical management.

Conclusions and Clinical Relevance—Ureteral ectopia can cause urinary incontinence in male dogs and is usually associated with other urinary tract abnormalities. Cystoscopic-guided laser ablation provided an effective and minimally invasive alternative to surgical management of intramural ureteral ectopia. (J Am Vet Med Assoc 2008;232:1026–1034)

Ureteral ectopia is a congenital abnormality of 1 or both ureters in which the ureteral orifice is located distal to the bladder trigone. This can be in the urethra, vagina, uterus, or vestibule in a female dog or anywhere along the urethra in a male dog.1 Ureteral ectopia is a result of dysembryogenesis of the urinary system.1–3 Ectopic ureters are classified anatomically as either intramural or extramural, with > 95% being described as intramural in dogs.1,4 Intramural ureters enter the bladder trigone in the normal position, fail to open into the bladder lumen, tunnel beyond the normal ureteral orifice position, and exit distally at variable locations within the urogenital tract. Ureteral ectopia has been commonly associated with multiple anomalies of the urinary tract (in > 90% of cases); anomalies include absent, small, or irregular kidneys; renal dysplasia; hydronephrosis; dilated ureters; ureteroceles; tortuous ureters; pelvic bladder; abnormal ureterovesicular junction shape; and urinary sphincter mechanism incompetence.1,3–7

Although ureteral ectopia has been reported in both purebred and mixed-breed dogs, it seems to be detected with greater frequency in the Labrador and Golden Retrievers, Siberian Huskies, Terriers (West Highland White Terrier and Wire Fox Terrier), Newfoundlands, and Poodles (Miniature and Toy).1,4,5 The most common clinical finding in these dogs is persistent or intermittent urinary incontinence since birth or weaning, with or without normal voiding patterns. A genetic association has been made in a small number of these breeds. Urinary incontinence may result secondary to urine drainage being distal to the trigone and internal urethral sphincter mechanism, physical disruption of the sphincter musculature by a displaced intramural ureter, or associated primary sphincter mechanism incompetence. Sphincter mechanism incompetence has been reported in 89% of female dogs evaluated by use of urodynamic studies.3,7 Other associated urinary conditions such as urinary tract infections (64% of female dogs),8 renal agenesis (4.8%),9 hydrouria (50%), hydronephrosis (27.1%), short urethras, and persistent paramecopholic remnants (82.6%) have been reported concurrently with ureteral ectopia.8 Many of these dogs are relinquished because of urinary incontinence or kept as outdoor pets.

Traditional treatment for ureteral ectopia includes 3 surgical techniques: neoureterostomy with ligation of the distal ureteric tunnel, neoureterostomy with ure-
thral-trigonal reconstruction, and neoureterocystostomy. These procedures require an open laparotomy, cystotomy, ureterotomy, and ureterotomy. Persistent postsurgical incontinence rate is reported to range from 42% to 78% in dogs. When comparing unilateral to bilateral ureteral ectopia, no difference in dogs treated surgically has been reported. Recently, a study comparing neoureterostomy with ligation of the distal portion of the tract and neoureterostomy with urethral-trigonal reconstruction was unable to detect substantial differences between the success of these 2 techniques; both resulted in high rates of persistent incontinence after surgery. The suggested benefits of dissection of the distal portion of the tract include restoration of an internal sphincter, diminished urinary stasis in the tunnel, and decreased risk of recanalization. Persistent incontinence is likely attributable to the concurrent urethral and sphincter abnormalities, with or without concurrent polyuria secondary to associated renal dysfunction, and necessitates medical intervention (phenylpropanolamine, diethylstilbestrol, or testosterone), transurethral injections of a submucosal bulking agent, or further surgery (eg, colposuspension or prostatectomy). Continence was restored with medications in 32% to 38% of dogs that had persistent incontinence after surgery. In dogs with primary sphincter mechanism incontinence without ureteral ectopia, bulking agents can be effective in 50% to 83% of cases. However, it is not known whether urethral bulking agents are equally efficacious in persistently incontinent dogs that have ureteral ectopia versus those dogs with primary urethral sphincter mechanism incompetence without ureteral ectopia.

Few reports of ureteral ectopia exist in male dogs, and most provide descriptions of surgical management. Unfortunately, many reports fail to separate the specific outcomes in male versus female dogs. Therefore, little is known regarding postsurgical continence rates in male dogs after surgery for ureteral ectopia. Ureteral ectopia is reported to be >20 times as common in female dogs as in male dogs. Most reported cases in males have been in continent dogs, possibly because the proximal location of the ectopia (proximal portion of the urethra) and the long male urethra provide a strong external muscular sphincter caudal to the ectopic orifice. Because of this, the true prevalence of ectopia in male dogs is underestimated, and this condition likely goes unrecognized. It is a condition that should be considered in dogs with other signs commonly associated with ureteral ectopia in a young dog (eg, hydroureret and hydrenephrosis).

The diagnostic method of choice for evaluating dogs for ureteral ectopia is now considered to be cystoscopy or CT. Use of a CLA technique may provide a minimally invasive alternative to surgery in some cases. This enables a diagnostic and therapeutic intervention to be performed simultaneously during the same anesthesia episode, avoiding the potential complications and risks associated with an open surgical technique. This procedure uses a cystoscope to directly view the ectopic orifice as well as guide a laser to ablate the tissue that forms the common medial ectopic ureteral wall and the lateral urethral wall. The purpose of the study reported here was to describe and evaluate the outcome of CLA for treatment of intramural ureteral ectopia in male dogs. The hypothesis was that this procedure is safe, effective, and associated with minimal morbidity or complications.

Materials and Methods

Case selection—The medical records of male dogs examined at the Matthew J. Ryan Veterinary Hospital of the University of Pennsylvania with a diagnosis of ureteral ectopia from January 2006 to January 2007 obtained by use of CT-IVU and cystoscopy and treated with the CLA procedure were reviewed. Cases were excluded if dogs had previous surgical manipulation performed prior to referral, evidence of extramural ureteral ectopia, did not have evaluation of renal and ureteral morphology via CT-IVU, or had <6 months’ follow-up time.

Historical and laboratory data—All dogs had a CBC, serum biochemical analysis, urinalysis, noninvasive blood pressure measurement, and urine bacteriologic culture and susceptibility prior to anesthesia. Data regarding signalment, incontinence history, history of a urinary tract infection, previous imaging information, clinical signs, duration of signs, physical examination findings, and morphology of the ectopia (unilateral, bilateral, location of ectopic ureteral orifice, ureteral dimensions, renal anatomy, and renal dimensions) were recorded.

CT examination—Computed tomographic excretory urography was performed in all dogs on a third-generation helical CT scanner prior to cystoscopy. Variations on described protocols were used. In all scans, the urinary bladder was catheterized and inflated with CO₂. Helical scans of the entire abdomen and pelvis (3-mm collimation and pitch of 1.7 or 5-mm collimation and pitch of 1.4) were performed before and after administration of contrast medium, and several thin-slice axial scans (2-mm contiguous sections) of the caudal portion of the abdomen and cranial portion of the pelvis were performed 3 to 14 minutes after injection of contrast medium (2 mL/kg [0.91 mg/mL], 5 mL/s). All studies were interpreted by the same radiologist (YPM).

CLA procedure—All cystoscopic laser procedures were performed by the same board-certified internist (ACB). The dogs were positioned in right lateral recumbency, and a flexible cystoscope was advanced up the urethral orifice in a retrograde fashion by use of manual irrigation with saline (0.9% NaCl) solution. The ectopic ureters were identified and locations were confirmed (Figure 2). Portable C-arm fluoroscopy was used to identify the ureteral orifice within the urethral lumen (Figure 3). A 0.035-inch, angled, hydrophilic-tip guidewire was advanced up the ureter through the working channel of the cystoscope under fluoroscopic guidance, marking the course of the ectopic ureter. This allowed the length of intramural ectopia to be estimated so that the tract could be safely obliterated with a laser. A 5-F, open-ended ureteral catheter was advanced over the guidewire into the distal portion of the ureter when the ureteral orifice was sufficiently large. A retrograde ureteropyelogram was performed by injecting 5 mL of contrast medium up the ureteral...
catheter to identify the ureteral path through the urethral wall and determine the anatomic features of the ureter and renal pelvis. Then 10 mL/kg (4.5 mL/lb) of a 50:50 mixture of contrast medium and saline solution was injected into the urethra through the cystoscope for a retrograde cystourethrogram, allowing for a combination cystourethroureteropyelogram. This permitted evaluation of the trigone in relation to the ureteral orifice and the transition of the ureter from intra- to extramural. Once the orifice was identified, the laser fiber (600-µm diode or 200-µm holmium:yttrium aluminum garnet) was inserted into the working channel of the cystoscope and directed into the ureteral orifice. The cystoscope was deflected toward the urethral lumen to angle the laser fiber’s tip toward the medial wall of the ureter, avoiding the lateral wall. The medial ureteral wall was then carefully cut in a continuous manner by use of the diode laser at 20 to 25 W or a pulsed manner by use of the holmium:yttrium aluminum garnet laser (16 Hz and 0.8 J). When the ureterovesicular junction was within the bladder lumen or the ureter appeared to be diverging from its path alongside the urethra or bladder lumen, suggesting the potential transition from its intramural to its extramural course, the laser treatment was considered complete.

A retrograde contrast urethrocytogram was performed in each dog after the CLA procedure to ensure there was no extravasation of contrast medium and to
identify the new location of the ureteral orifice relative to the bladder trigone both cystoscopically and fluoroscopically (Figure 3). Dogs were administered butenorphine (10 to 20 µg/kg [4.5 to 9.1 µg/lb]) upon recovery from the laser procedure, and their urethras were infused with a bupivicaine (1 mg/kg [0.45 mg/lb]) and saline solution mixture (1:1) for local transurethral analgesia. Intravenous fluid therapy (3 to 4 mL/kg/h [1.4 to 1.8 mL/lb/h]) was administered for diuresis after IV administration of contrast medium until discharge.

Postoperative management—at discharge, owners were provided with an analgesic to be administered for signs of pain as needed, a nonsteroidal anti-inflammation drug to be administered for 6 days if dogs were nonazotemic, and amoxicillin to be administered for 3 days. Bacteriologic culture of urine was performed at 2 weeks, 6 weeks, 3 months, and 6 months.

Follow-up—A CBC, SUN and creatinine concentrations, urinalysis, and culture were performed at 6 weeks. A CT scan and cystoscopy were performed in 3 of 4 dogs at 6 weeks as well (Figures 1 and 3). All owners were contacted at 1, 2, 4, 12, and 24 weeks after surgery. Owners were then contacted every 6 months thereafter. Continence status, quality of life, and medical concerns were discussed.

Results

All dogs (median age, 3.2 years; range, 1.6 to 6 years) had a 1- to 3-year history of urinary incontinence that started at 2 to 40 months of age (mean, 15.5 months; median, 12.5 months; range, 2 to 40 months). Other problems included recurrent urinary tract infection (n = 1), renal azotemia (2), renal insufficiency (4), polyuria and polydipsia (3), hydroureter (2), hydronephrosis (1), and renal agenesis (1). Before surgery, renal insufficiency (urine specific gravity < 1.025) was detected in all dogs, and mild to moderate azotemia was detected in 2 of 4 dogs. The 2 dogs with azotemia (creatinine concentration, 2.1 and 2.7 mg/dL) were proteinuric (urine protein-to-creati-
nine ratio, 1.8 and 2.62). One of these dogs was also mildly anemic (PCV, 35%) and hypertensive (systolic arterial blood pressure, 180 mm Hg). Bacteriologic culture of urine was not performed in the 1 dog with a history of urinary tract infections, but the dog’s condition improved in response to antimicrobials when the dog developed polyuria. In none of the dogs were results of bacteriologic culture of urine positive prior to or after the procedure.

CT before surgery—In all 4 dogs, intramural ectopic ureters were diagnosed via CT-IVU (Figures 1, 4, and 5). Bilateral ectopia was detected in 2 dogs, and unilateral ectopia was detected in 1 (because of renal agenesis, this

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![Figure 4](image1.png)

**Figure 4**—Computed tomographic images in a male dog with agenesis of the right ureter. A—Notice hydroureter (20- to 30-mm diameter) affecting the left ureter. B—Notice the left ureter, with thin medial wall, coursing intramurally and transversely through the bladder. C—Notice the ureteral orifice in the proximal portion of the urethra. D—Notice the new ureteral orifice entering the bladder at the level of the trigone at the 6-week follow-up examination.

![Figure 5](image2.png)

**Figure 5**—Negative contrast cystographic view during a CT scan of a male dog with ureteral ectopia. A—Notice intramural ureters (white arrow) coursing transversely through the dorsal portion of the bladder wall. B—Notice the ectopic ureters entering the prostatic portion of the urethra (P = prostate). C—Notice intravesicular orifice in the urinary bladder with contrast medium filling the bladder from that orifice.
dog had only 1 kidney). One dog had 1 clearly ectopic ureter and 1 questionably orthotopic ureter that seemed to have 1 opening in the distal portion of the bladder at the trigone, whereas the ectopic orifice was in the proximal portion of the prostatic urethra. This dog had evidence of bilateral ureteral ectopia on cystoscopic evaluation, although 1 ureter was more distal than the other. Ureteral dilation was present in 2 of 4 dogs, 1 of which had only 1 kidney and ureter. The other 2 dogs were considered to have normal ureteral diameter (up to 3 mm; 1 ureter had focal segmental dilation to 5 mm). The 2 dogs with normal ureteral size had normally shaped, normally sized kidneys, whereas the 2 dogs with hydrourereters also had hydronephrosis and irregularly shaped kidneys. One dog had severe asymmetric hydronephrosis and hydroureter, worse on the left side. The left renal pelvis and ureter did not enhance on CT scans at 10 and 30 minutes after IV injection of contrast medium. All ectopic ureters tunneled intramurally in the proximal portion of the urethra, and their openings were located in the proximal aspect of the prostatic urethra (Figures 2 and 5).

**Postprocedural CT-IVU**—Cranial displacement of the ectopic orifice was noted on postprocedural scans in all 3 dogs that had such imaging (Figures 1, 4, and 6). All ureters that were rescanned after laser ablation had a clear advancement of the ureteral orifice. In 2 of 7 ureters, the exact location (extreme caudal aspect of trigone vs proximal urethra) could not be determined with certainty on the CT-IVU, where they were confirmed with cystoscopic evaluation (at the bladder trigone). In the 2 dogs that had hydronephrosis and hydroureter at the time of diagnosis, marked reductions in renal pelvis and ureteral diameter were noted on postprocedural scans (with a factor of 3 to 4 for the ureters and 2 for the renal pelvis; Figures 1 and 6).

Cystoscopic evaluation confirmed the ureteral orifices prior to CLA of all ureters to be ectopic, exiting within the mid to proximal portion of the prostatic urethra, and 7 of 7 ureters were intramurally ectopic (3 of 4 dogs had bilateral ectopia, and 1 dog had only 1 kidney and ureter; Figures 4 and 5). Retrograde urethro-cystoscopy confirmed an ectopic location at the start of the ablation in all cases and was then confirmed at the end of the procedure to be appropriately advanced to—or cranial to—the trigone (Figure 2).

Bilateral ectopia was identified in 1 dog, although after initial ablation and tissue manipulation of the right ureter, which was the more productive side as judged via CT-IVU and cystoscopy, the left orifice could not be identified. Urine was not seen to be flowing out of the orifice during the cystoscopy, and after tissue manipulation in the urethra, the orifice was difficult to identify. This dog only had the right ureter ablated at the initial evaluation. All other dogs had both ureters ablated at the first procedure. This dog had the left ureter lasered to the level of the right ureter at the 6-week reevaluation, which placed both orifices well within the bladder. Median procedure time was 130 minutes for all dogs (range, 90 to 185 minutes). All dogs were discharged either the same day or the next morning. There was no postoperative evidence of dysuria, hematuria, or discomfort.

Six-week follow-up with CT-IVU scan (Figures 1, 2, 4, 5, and 6) and cystoscopy (Figure 3) was performed in 3 of the 4 dogs. This confirmed that no ureteral tunnel had reformed, all tissue had healed in a smooth and regular fashion, and the orifice that was created was anatomically similar to where it was created 6 weeks prior. Each orifice had a typical C (cup) shape and was similar to a normal intravesical orifice.

Postprocedure follow-up time was a median of 18 months (range, 15 to 20 months). All 4 dogs were considered immediately continent after the procedure with no evidence of unconsciously dribbling urine according to the owners. The dog that initially only had 1 ureter ablated was reported to have 1 to 2 drops of urine dribble from the prepuce after sleeping, once or twice

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Figure 6—Computed tomographic scans after IV contrast medium administration of a male dog with ureteral ectopia, before and after a CLA procedure. A—Image obtained before CLA. Notice dimensions of the distal portion of the ureter with air-contrast interface in the left ureter. B—Image obtained 6 weeks after CLA. Notice smaller dimensions of the distal portion of the ureter, with contrast medium in the urinary bladder.
per week. This resolved completely after the second ureter was lasered. At the 1-day and 1-week follow-up, all dogs were active and seemingly pain free, which was the same throughout all of the follow-up queries. No dogs required postoperative administration of medications (eg, testosterone, methyltestosterone, or phenypropanolamine) or collagen implantation to maintain continence. No dog had a recurrent urinary tract infection identified at the 2-week, 3-month, 6-month, or 1-year culture. The azotemia remained stable in 1 dog (creatinine concentration before treatment, 2.7 mg/dL; 6 months after treatment, 2.2 mg/dL) and improved in the other azotemic dog by the 9-month recheck (creatinine before treatment, 2.1 mg/dL; 9 months after treatment, 1.7 mg/dL). All owners considered the outcome for their dogs excellent from immediately after the procedure until the last follow-up (> 12 months after the procedure).

**Discussion**

Results of the present study revealed that ureteral ectopia in male dogs can result in urinary incontinence with minimally displaced ureters (ie, in the proximal portion of the urethra). All dogs in this study had ectopia in similar locations at the proximal to middle regions of the prostatic portion of the urethra (7/7 ureters). Minimally invasive treatment with the CLA procedure was successful, effective, and associated with minimal morbidity. There are few reports in the current literature on ureteral ectopia in male dogs, and findings in the present study suggested that male dogs may develop clinical signs of ectopia at an older age (mean, 15.5 months; median, 12.5 months; range, 2 to 40 months), compared with females. It is possible that renal insufficiency, in some instances with resultant polyuria, plays a role in the onset of incontinence in previously continence dogs. All 4 dogs in our study likely had renal insufficiency (ie, low urine specific gravity), but only 2 were azotemic. Many male dogs with ureteral ectopia do not have incontinence; it is proposed that this is because most ectopic ureters terminate in the prostatic portion of the urethra, which is considered the “continent zone of male dogs.” If the ureters terminate cranial to the external urethral sphincter, retrograde filling of the bladder may occur. Also, because of the long urethra and strong external urethral sphincter in male dogs, urinary incontinence is seemingly less common than in females. Therefore, the true prevalence of ectopic ureters in male dogs is likely underestimated and should be considered in male dogs with recurrent urinary tract infections, renal agenesis, hydrourerter, or hydrenephrosis.

Hydrenephrosis (27%) and hydroureters (50%) are commonly reported in dogs with ureteral ectopia. The exact pathogenesis is not clear, but these findings may be secondary to functional or physical ureteral obstruction. Other suggested causes include congenital anatomic abnormality, urine reflux during urination, lack of peristalsis, and chronic pyelonephritis. The ureteral orifices in the 2 dogs of this report with hydroureter were actually larger than normal, which was also described in another report. Nevertheless, this may not disprove the theory of an intermittent functional obstruction. The pressure within the lumen of the prostatic portion of the urethra is typically higher than intravesicular pressure, particularly during the storage phase. This theory is likely supported by the fact that neither dog had evidence of chronic pyelonephritis and both dogs had substantial improvement in ureteral diameter after laser ablation of the ectopic ureters. This would also support the idea that male dogs with hydrourerter and hydrenephrosis that are not incontinent should be evaluated for ureteral ectopia. If a diagnosis of ureteral ectopia is established, treatment may improve the hydrourerter and hydrenephrosis and subsequently reduce renal insufficiency.

The previously reported clinical findings of polyuria and polydipsia, chronic urinary tract infections, and urinary incontinence in dogs with hydrourerter and hydrenephrosis were consistent with findings in the 4 dogs of this study. Two dogs had substantial proteinuria and unremarkable urine sediment, negative results of bacteriologic culture of urine, and renal azotemia. One of these dogs also had systemic hypertension, moderate nonregenerative anemia, unilateral renal and ureteral agenesis, and hydrourerter with hydrenephrosis. The hydrourerter and hydrenephrosis were dramatically improved at 6 weeks in both dogs, as was the azotemia. The proteinuria resolved in 1 dog and persisted in the other. That dog was subsequently treated with antihypertensive medications, aspirin, and a low-protein renal diet, and blood pressure stabilized. Whether this could be directly attributed to the CLA treatment is debatable, although one could conjecture that the improvement in hydrourerter and hydrenephrosis suggested that a decrease in ureteral hydrostatic pressure may lead to improved renal function. No urinary tract infection was detected at the time of the procedure or at any follow-up point after CLA in any dog. It was also interesting that the urine specific gravities in all male dogs were low (< 1.025), suggesting that they became incontinent when renal insufficiency ensued or that they were more likely to have associated chronic renal disease than were female dogs.

The CT-IVU performed prior to treatment confirmed intramural ureteral ectopia and the anatomic location of the ureteral orifice and aided in defining the anatomic features of the renal pelvis, ureters and ureteral orifice. All ureters were ectopic, intramural, and located in the middle to proximal regions of the prostatic portion of the urethra, which was consistent with other reports in male dogs. Although the post-CLA CT-IVU studies were helpful in evaluating the outcome of the procedure, they primarily revealed improvement in hydrourerter and hydrenephrosis, which can also be evaluated via ultrasonography. Clinically, complete resolution of incontinence is the desired outcome, and reevaluation with CT or cystoscopy is likely unnecessary. Although the new cranial position of the ureteral orifice was clear in some of the dogs, interpretation of the CT-IVU in other dogs was difficult. When multiple views obtained at different times were available, emptying of the ureter into the bladder was observed in only 1 series and in some cases in only 1 or 2 of the images. This emphasizes the importance of obtaining a large number of images in a series with thin collimation of...
the trigone region. In 1 dog, the insertion site of the left ureter could not be clearly determined. It is possible that additional series would have revealed emptying of the contrast medium. Whether this intermittent emptying is the nature of all ureters or is just more obvious in dogs with ectopic ureters because of changes in ureteral peristalsis is not yet known.

Cystoscopy was used to identify the ureteral orifices, and all ureters were easily visible before the procedure. The authors do not believe that CT-IVU and cystoscopy are both necessary for a diagnosis, but the benefit of CT-IVU is that the morphology of the entire urinary system and the intra- versus extramural nature of the ureters can be identified. If the ureters are catheterized during cystoscopy or retrograde urethrocytography confirms reflux and ureteral location so that a retrograde ureteropyelogram can be performed via fluoroscopy, the morphology and intramural nature can be confirmed, and CT-IVU may not be necessary. It is difficult to confirm the intramural nature of ectopia with cystoscopy alone, particularly the point at which the transition from intra- to extramural occurs. To have fluoroscopy available is helpful. Although extramural ureteral ectopia is rare, such affected animals are not candidates for the CLA procedure, and having this information will prevent a potentially severe complication from happening.

The procedure was considered successful in all dogs, with success defined as postprocedural continence. Typically, the ureteral orifice in a male dog is more difficult to visualize with a small fiber-optic endoscope, whereas in a female dog, a larger rigid cystoscope can be used and provides superior image quality and a 30° lens angle toward the orifice. This is likely why this procedure takes longer in male than female dogs. At the 6 week reevaluation, none of the tracts had recanalized, and each orifice healed in a smooth and regular fashion.

The overall outcome in these 4 male dogs was excellent. There was no postprocedural dysuria, hematuria, or discomfort according to the owners. All dogs were ready to go home the day of the procedure and had normal urinary streams after recovery. The outcome in male dogs is hard to compare with that of female dogs, with success defined as postprocedural continence. Male dogs become incontinent, which is why they develop incontinence later in life. By bringing the ureters cranial toward the trigone, the dog is returned to continence relatively easily. One interesting finding was that 2 of the 4 dogs were sexually intact, and those dogs became incontinent later in life (at 14 and 40 months). The 2 neutered dogs were believed to be incontinent at a younger age (2 and 6 months, respectively). One of those 2 dogs was incontinent before being neutered, and the other was neutered at 4 months and incontinence detected at 6 months of age. It is hard to discern on the basis of these 4 cases whether there was an association between incontinence with male ectopia and being neutered, but 3 of 4 dogs were incontinent when sexually intact, making this unlikely. Sphincter mechanism incompetence has been widely reported in male dogs, and it would not be surprising if it were associated with ureteral ectopia, as in females. There has not been a clear association between castration and incontinence caused by ureteral sphincter mechanism incompetence in male dogs.

Surgical management of ectopic ureters has been the mainstay of treatment to this point. Because of the small number of cases reported here, it is difficult to say whether CLA provides an advantage in postoperative continence rate, compared with that of traditional surgery. Although all dogs in this study remained continent after the CLA procedure, it is possible that many male dogs have a superior outcome, compared with females, when treated via either surgical or endoscopic fixation. Unfortunately, limited information is available in the veterinary literature regarding outcome in male dogs treated with surgery. Male dogs can, however, represent a surgical challenge, especially if resection of the distal portion of the tract is attempted. The distal ureteric opening is usually in the prostatic portion of the urethra, and much dissection is avoided by use of this laser procedure. Potential complications of surgery that can be avoided include hemorrhage, stricture of the stoma, and dehiscence of the cystotomy or laparotomy incisions. The main complication that could occur is iatrogenic urethral or ureteral wall penetration leading to peritoneal urine leakage. No complications were seen in the 4 dogs reported here, which suggested that complications can be avoided by use of the combination of cystoscopy and fluoroscopy. One general advantage of CLA is its minimally invasive nature, making it likely that the dogs have less postoperative discomfort and a more rapid return to function, compared with traditional surgery. The authors suggest that male dogs represent good candidates for CLA if they have intramural ectopic ureters. If the ureters are suspected to be extramural, if the orifice is too small to accept the laser fiber, or if the urethra is too small to accept the 2.7-mm flexible cystoscope (approx < 6 kg), surgery should be considered.

The primary limitation of this study was the small number of dogs, with only 3 of 4 dogs having a 6-week follow-up examination with imaging. The potential complications of ureteral tears, urethral tears, bleeding, stricture, and recanalization did not occur in these dogs but are potential concerns. The dogs also had variable renal function, which caused the degree of polyuria to vary and the time of incontinence to differ among the 4 dogs.

Unfortunately, no urethral pressure profilometry studies were conducted, and this information would have been helpful in characterizing sphincter incompetence before and after laser ablation. The authors believe that use of smaller side-firing laser fibers would shorten the duration of the procedure. This would avoid the need for a urethral catheter.

a. GE Prospeed computed tomography scanner, General Electric Co, Milwaukee, Wis.
b. Iohexol, 240 mg/mL, GE Healthcare Inc, Princeton, NJ.
c. Storz Flex X2 ureteroscope, Karl Storz Endoscopy, Culver City, Calif.
d. ALCUURF UTW8-8 Elite ureteroscope, ALCU, Corp, Southborough, Mass.
e. Iodine-123, Fluoroscopy, Siemens, Malvern, Pa.
f. Weasel Wire 0.035-inch hydrophilic angle-tipped guidewire, Infini Medical LLC, Haverford, Pa.
References