Case Study #3

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Signalment: 4 month old female intact Golden Retriever
Presenting Complaint: Owner is unable to house train, urine staining around hind end
Past pertinent history: Always wet around back end. Bad smelling urine. Urine culture positive for *E.coli* and sensitive to Clavamox therapy. With treatment odor resolved but incontinence persisted.
Medications: Clavamox (15 mg/kg PO BID), phenylpropanolamine (1.5 mg/kg PO TID)
Physical Examination: Bright, alert, good body condition. Urine staining around fur of tail, vulva and medial aspect of both hindlimbs. Slightly recessed vulva. Normal neurologic examination with good anal tone. The remainder of the examination was within normal limits. Rectal examination palpated a wide urethra with evidence of the bladder neck at the level of the pubis.
CBC: slight normochromic normocytic non-regenerative anemia of 33%
Serum Biochemical Profile: BUN: 13 mg/dL, Creatinine 0.4 mg/dL, Phosphorus 12 mg/dL
Urinalysis: USG: 1.021, no white blood cells, no red blood cells/hpf, no crystals, no bacteria seen, pH 6.5
Abdominal Radiographs: within normal limits
Abdominal Ultrasound: Loss of architecture to both kidneys. Minimal pyelectasia (2.5 mm) bilaterally. Empty bladder, unable to perform cystocentesis.
Urine culture: negative (while still on Clavamox)
Blood pressure: 130 mmHg systolic

Problem List:

1) Urinary Incontinence
2) History of Urinary Tract Infection
3) Recessed Vulva
4) Bladder neck caudally displaced

Presumptive Diagnosis: Possible ectopic ureter(s), urethral sphincter mechanism incompetence (USMI), short urethral syndrome

Further Diagnostics:
Cystoscopy: Figure 1
Retrograde Ureteropyelography: Figure 2
Vaginoscopy: Figure 3

Diagnosis:

1) Bilateral Intramural Ureteral Ectopia
2) Bilateral hydroureter and hydronephrosis
3) Short Urethra Syndrome with a hypoplastic bladder
4) Persistant Paramesonephric remnant (PPMR) that extended back to the cervix (vaginal septum)

Treatment decisions:
During the diagnostic cystoscopy a diode laser was used to perform a cystoscopic guided laser ablation (CLA-EU) of the intramural bilateral ectopic ureters. The right ureter was displaced in the mid urethra and the left was in the proximal urethra. Both were intramurally tunneling from the bladder into the urethral lumen where the opening was. This was diagnosed based on the retrograde ureteropyelogram where the ureters and renal pelvis' were seen to be dilated. Once this was complete the laser was used to ablate the vaginal remnant as well to create a normal vagina to try and prevent urine pooling and potential vaginitis in the future.

Outcome:
This patient was discharged the same afternoon as the procedure to continue another 2 weeks of Clavamox and 2 days of Tramadol (3 mg/kg PO TID) as needed. Over the following 4 weeks she was completely continent. Urine culture at 4 weeks was negative. At 7 months of age she starting having some urine spotting at night at which time the phenylpropanolamine was started at 1.5 mg/kg PO at night before bed. This made her 100% continent. At 2 years she has no evidence of urinary incontinence. Her renal pelvis size was reassessed 6 weeks after the CLA-EU and there was no evidence of renal pelvic dilation of hydroureter bilaterally.

Discussion:
Ectopic ureters are a congenital anomaly of the urinary system where the ureteral orifice is inappropriately positioned caudal to the urinary bladder (i.e. the bladder neck, urethra, vagina, vestibule or uterus). This is the most common cause of urinary incontinence in juvenile female dogs. The embryological foundation of this condition is thought to result from the abnormal differentiation of mesonephric and metanephric duct systems, resulting in inappropriate ureteral tube termination and malposition of the ureteral orifice.

Although ectopic ureters have been reported in male and female dogs, as well as both pure and mixed breed dogs, it seems to occur with greater frequency in female than male dogs, as well as certain breeds (i.e. Siberian Huskies, Newfoundlands, Laborador

Retrievers, Golden Retrievers, Terriers, and Poodles The most common clinical finding in these dogs is constant or intermittent urinary leaking since birth or weaning, though many dogs present after a period of continence, and are only incontinent in certain positions.

Suspected concurrent bladder and/or urethral functional anomalies, like urethral sphincter mechanism incompetence (USMI), has been reported in 75-89% of female dogs evaluated, though in one study there was no significant difference in outcome after surgery in dogs with or without USMI. Other associated urinary conditions include urinary tract infections, renal dysplasia, hydroureter (34-50%) or hydronephrosis (15-27%), short urethras, persistent paramesonephric remnants, and/or vaginal septum or dual vaginas.

Various methods of surgical fixation have been described, all of which require a laparotomy, cystotomy, ureterotomy, +/- urethrotomy. The complication rates with surgery vary and in one report there was a 14% complication rate overall, with 50% of dogs after ureteral re-implantation developing worsening hydroureter or hydronephrosis, 16% of dogs after the intravesciular transplantation technique having dysuria, and 8% of dogs with ureteronephrectomy developing renal failure. Unfortunately, the post-operative continence rates reported in female dogs continue to be low, regardless of the surgical technique performed, varying between 25 and 58% with or without concurrent medical management. Since many of these dogs are relinquished or euthanized because of urinary incontinence issues, these disappointing outcomes made the search for other alternatives appealing. The failure to obtain continence in these dogs is most likely due to their concurrent USMI, rather than failure of the procedure.

The diagnostic method of choice for evaluating dogs for EU is now considered to be cystoscopy or CT. The use of the cystoscopic-guided laser ablation (CLA-EU) technique, first described in one female dog in 2006 and 4 male dogs in 2008, provides a minimally invasive alternative to surgery in cases with intramural EU. This procedure enables the diagnosis to be made while simultaneously performing a therapeutic intervention, and also potentially avoiding some of the complications and risks associated with the open surgical techniques described. This procedure uses cystoscopy and fluoroscopy to directly visualize the ureteral orifice, assess for any other urinary anomalies (vaginal septum, persistent paramesonephric remnant, dual vagina, hydroureter, hydronephrosis, etc), as well as guide a laser to ablate the tissue that forms the medial ectopic ureteral wall, so the orifice can be re-positioned into the urinary bladder neck (SEE FIGURE 1).

Recently the authors finished a prospective study evaluating 30 female dogs with EU corrected with CLA-EU. 77% of dogs were continent at >12 months follow-up (47% with CLA-EU alone, 57% with additional medications, 60% with additional collagen injections, and 77% with the addition of a hydraulic occluder or artificial urethral sphincter). The study overall showed that CLA-EU provided an effective, safe and minimally invasive alternative to surgery of intramural ectopic ureters in female dogs where concurrent diagnosis and treatment was accomplished on an outpatient basis with minimal complications when compared to surgery.

IR/IE Tip:
Patients with urinary incontinence can have a normal abdominal ultrasound examination or intravenous pyelogram study. The most sensitive test for diagnosis of ecoptic ureters is cystoscopy and Contrast-enhanced Computed Tomography (CECT). Due to the possibility of cystoscopic guided laser ablation of ectopic ureters (CLA-EU) the diagnostic of choice for the authors is cystoscopy, which can allow for diagnosis and treatment simultaneously, avoiding the need for multiple anesthesia events and improving the overall cost to the client.

It is also important to remember that dogs with ectopic ureters nearly always have other concurrent anatomical anomalies like hydroureter, hydronephrosis, intrapelvic bladders, short urethral, hypoplastic bladders, vaginal septums, a dual vagina, a persistent paramesonephric remnant and urethral sphinchter mechanism incompetence. Approximately 90% of dogs have concurrent USMI and that is why traditional surgery and CLA-EU are not 100% effective in curing the urinary incontinence. This should be discussed with the owners prior to treatment, as other concurrent therapy (like medications, urethral sphincter bulking agents, surgery or the placement of an artificial urethral sphincter [hydraulic occluder] may need to be considered in the future).

***for more case examples and to see how interventional radiology and interventional endoscopy (IR/IE) can benefit your patients please see the following website: http://www.amcny.org/interventional-radiology-endoscopy

RECOMMENDED READING

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LEGEND

FIGURE 1: Endoscopic images of a dog with ectopic ureters. The dog is in dorsal recumbency during a cystourethroscopy. A) The left ectopic ureteral opening is visualized inside the urethral lumen (yellow asterick). B) An open ended ureteral catheter is placed inside the ectopic ureteral lumen (black arrow). C) A diode laser (red arrow) is cutting the medial ureteral wall over the ureteral catheter (black arrow) to advance up the neo-ureteral orifice to the bladder lumen. D) The neo-ureteral orifice is now inside the urinary bladder lumen (yellow asterick) A guidewire (black arrow) is still inside the ureteral lumen.

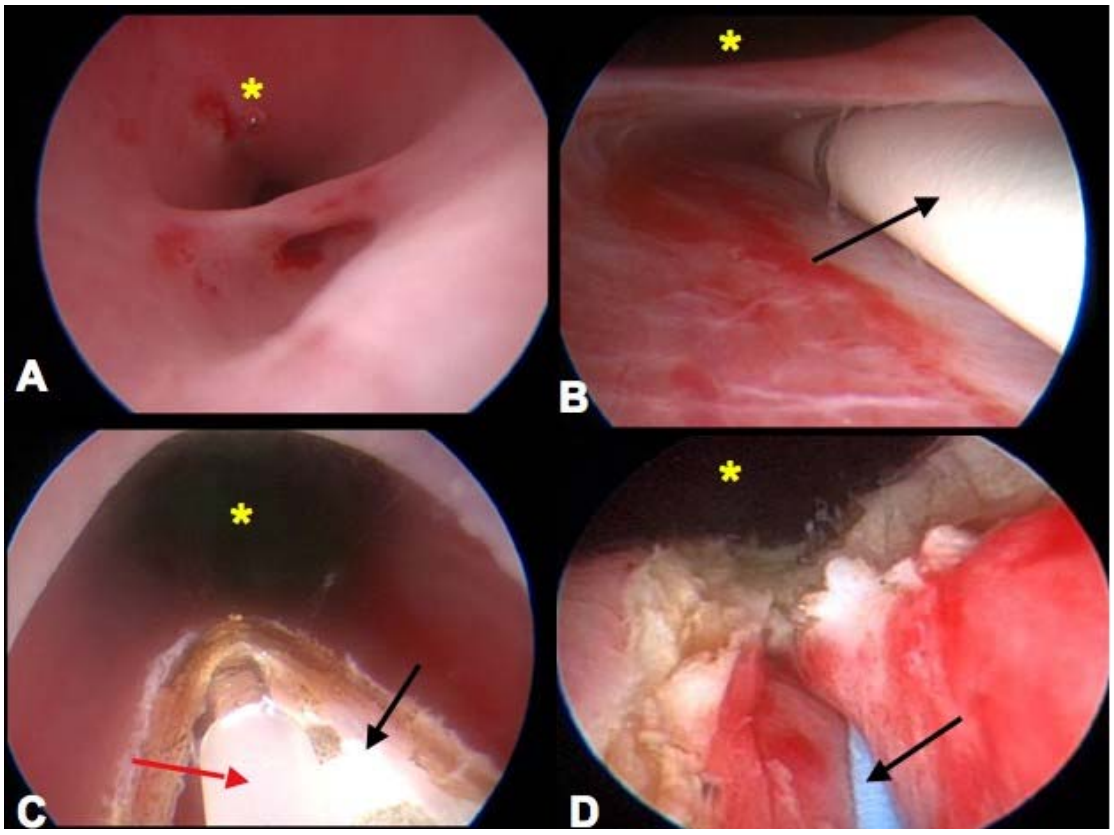


FIGURE 2. Fluoroscopic image of a dog during a retrograde ureteropyelogram and concurrent cystourethrogram. The bladder is filled with contrast material. The rigid cystoscopy is at the level of the bladder trigone and a guidewire is inside the ureteral lumen coursing through the intramural tunnel and then transitions extramurally beyond the bladder trigone.

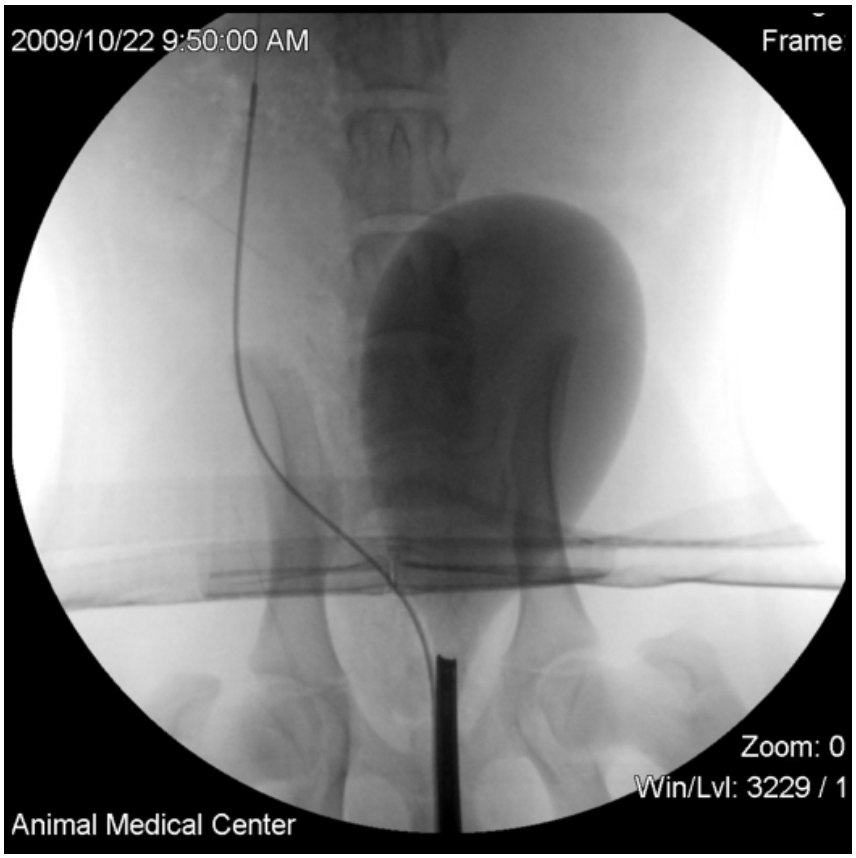
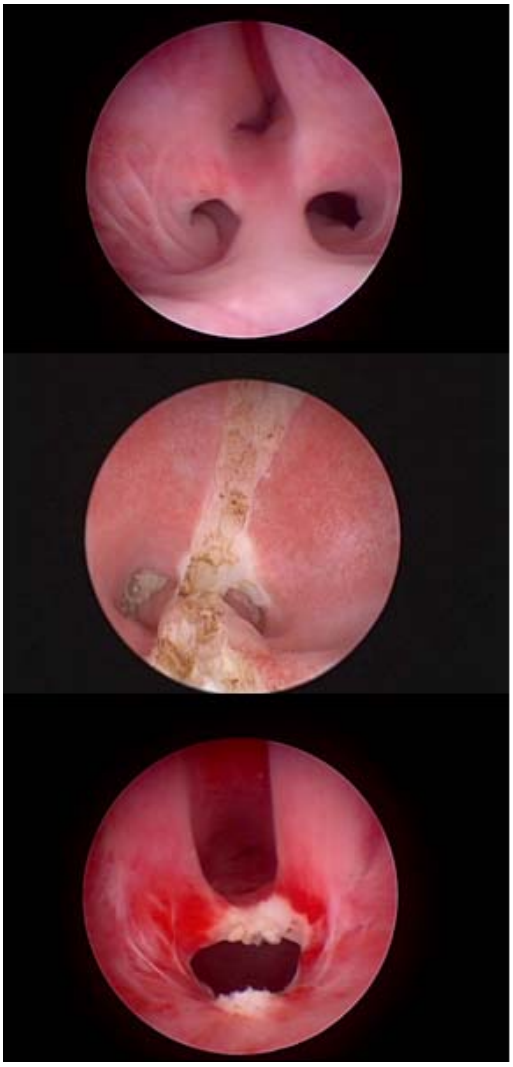


FIGURE 3. Endoscopic image with the dog in dorsal recumbency after the CLA-EU procedure. The top image shows a thick vaginal band (persistent paramesonephric remnant [PPMR]) pulling the urethral orifice open. This band splits the vaginal opening into 2 compartments. The middle image is the remnant of the vaginal band after it is laser ablated with a diode laser. This band went all the way back to the cervix and was completely cut down with the laser to the level of the cervix seen here. The bottom image is the vaginal (bottom) and urethral orifice (top) after the PPMR is lasered open showing an open vagina.



References: more available upon request

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