Ureteral ectopia (UE) is 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 accounting for over 50% of cases in one study, compared to only 5% of incontinent adult dogs.

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 (>20:1), as well as certain breeds (i.e. Siberian Huskies, Newfoundlands, Retrievers [Laborador or Golden], Terriers, and Poodles [miniature and toy]). 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 such as urinary tract infections (64%), renal agenesis (5%), renal dysplasia, hydroureter (34-50%) or hydronephrosis (15-27%), short urethras (21%), persistent paramesonephric remnants (83%) and/or vaginal septum or dual vaginas (8%), hormonal imbalances, and ureteroceles have all been reported concurrently.

The embryological basis of this condition is suggested to result from inappropriate differentiation of the mesonephric and metanephric duct systems. This results in inappropriate ureteral tube termination and ultimate malposition of the ureteral orifice. The urogenital sinus, which becomes bladder and urethra, may also differentiate inappropriately, resulting in termination of the ureters in the bladder neck, prostate, or urethra. Ectopic ureters tunnel either intramurally or extramurally, with over 95% reported to be intramural in dogs. The typical intramural ectopic ureter(s) will enter the distal bladder neck in a relatively normal position but fail to open into the bladder lumen, traversing the urethra to the level of the prostate, vestibule or vagina in the submucosal tissue, where it terminates.

Traditional therapeutic intervention for UE includes 3 main surgical techniques: neoureterostomy with ligation of the distal ureteric tunnel, neoureterostomy with urethral-trigonal reconstruction, and neoureterocystostomy (ureteral re-implantation). These procedures require an open laparotomy, cystotomy, ureterotomy, and urethroty. 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 intravesicular transplantation technique having dysuria, and 8% of dogs with ureteronephrectomy developing renal failure. Unfortunately, the post-operative continence rates reported in dogs continue to be low, regardless of the surgical technique performed, varying between 25 and 58% with or without concurrent medical management. When comparing unilateral to bilateral UE, no difference in female 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 two 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 re-canalization. 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 prostatopexy). Continence was restored with medications in 32% to 38% of dogs that had persistent incontinence after surgery. In dogs with primary SMU without EU, 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 UE versus those dogs with primary USMI without UE. In the author’s experience dogs with concurrent UE (regardless of previous fixation method) do not hold urethral bulking agents well. This may be due abnormalities in the mucosal/submucosal urethral tissue strength or due to the fact that a majority of these dogs have very wide and short urethras. 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 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 by Dr. McCarthy and in 4 male dogs in 2008 by our group, provides a minimally invasive alternative to surgery in cases with intramural EU. Since that time there have been a few abstracts describing this procedure in small groups of dogs, and more recently a small retrospective series looking at 16 dogs. 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, ureteroceles, 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. During this procedure the vaginal remnant is also typically ablated with the laser to potentially aid in any contribution this might have to urinary incontinence or chronic urinary tract infections. This lecture will expand upon the results of a larger number of female and male dogs that were prospectively evaluated after cystoscopic guided laser ablation therapy.

**PROSPECTIVE EVALUATION OF CLA-EU**

30 female and 4 male dogs that had the CLA-EU procedure performed were prospectively evaluated. In female dogs the CLA-EU procedure is done through a rigid cystoscope using a diode or Holmium:YAG laser. In male dogs it is either done through the penile urethra using a flexible cystoscope and Holmium:YAG laser or using a percutaneous perineal needle access approach using a rigid cystoscope. Prior to performing this procedure a retrograde ureteropyelogram is performed under fluoroscopic guidance to confirm the intramural nature of each ectopic ureter. All techniques will be expanded upon in this lecture.

In the 30 female dogs, 100% of the ectopic ureteral orifices were initially located in the urethra, and 100% were able to be relocated into the urinary bladder. 60% had bilateral ectopia and 100% had other concurrent urinary anomalies. 23 of 30 (77%) dogs were continent at >12 months follow-up (that continence rate was 47% with CLA-EU alone, 57% with additional
medications, 60% with additional collagen injections, and 77% with the addition of a hydraulic occluder [HO]). In the 16 residually incontinent dogs after the CLA-EU alone medical management was implemented and phenylpropanolamine was effective in 3/16 (18.75%), while diethylstilbestrol was not effective in any of the 5 patients it was tried on. Medical supplementation improved the continence rate to 17/30 (57%). Transurethral bulking-agent injections (bovine collagen 5/7; hydroxyapatite 2/7) were performed in 7/13 residually incontinent patients after failing adjunctive medical management and was effective in 2/7 (28.5%), improving the overall continence rate to 19/30 (63%). Five out of 11 residually incontinent patients that failed medical and/or bulking-agent intervention had a HO placed. This was effective in 4/5 (80%) dogs, improving the overall continence rate to 23/30 (77%). Two patients had a colposuspension performed during the course of the study and neither procedure was effective long-term (0%).

The remaining incontinent dogs did not have a hydraulic occluder placed, suggesting continence score could have ultimately been higher. All dogs were re-scoped within 6-8 weeks after the CLA-EU. No dog had evidence of post-operative dysuria. One female dog had evidence of polypoid cystitis at the neo-ureteral stoma at 6 weeks and resolved on 3 month re-evaluation. Median follow-up was 2.7 years (range 12-62 months). One dog not included in this study developed a suspected laser reaction at the neo-UVJ resulting in a ureteral obstruction. This seems to be uncommon in all the cases done to date, but should be considered and evaluated for on 6 week follow-up. All dogs had their vaginal defects (PPMR, dual vagina or vaginal septum) treated with laser ablation as well.

In the 4 male dogs, all EU openings were within the prostatic urethra and were intramural in nature. ¾ dogs had bilateral ectopia and the other dog was uninephric and its only ureter was ectopic totaling 7 ureters. 2/4 had hydroureter and hydronephrosis documented on retrograde ureteropyelogram and CT-IVP and both dogs had improvement in the ureteral and renal pelvis dilation at the 6 week recheck. No postoperative dysuria or hematuria occurred post operatively. All male dogs were immediately continent after laser treatment and remained so at a median follow-up of 23 months (range 12-34 months) without medical management.

When evaluated together 27/34 (80%) of dogs were continent with a combination of CLA-EU, medical management, bulking-agent injections and/or the placement of a hydraulic occluder device. 18/34 (53%) were continent after the CLA-EU procedure alone. To date over 60 dogs have had this procedure performed in the author’s practice with similar success rates.

Another talk in this forum will focus on the use of the hydraulic occluder device for refractory urinary incontinence so it will not be expanded upon here.

In conclusion, the CLA-EU procedure is safe and at least as effective as the traditional surgical techniques previously reported. This procedure is met with few complications and can be considered at the time of the diagnosis of ectopic ureters during cystoscopy. This procedure allows the clinician to avoid invasive surgery until it is known if the procedure is successful, at which time the patient can have other supplemental fixation procedures at the time of routine ovariectiontomy/ovariohysterectomy. Even though complications were rare, they did exist and it is currently recommended that all dogs have a urinary tract ultrasound to evaluate any progression in hydroureter or hydronephrosis after this procedure (as it should be suggested after any surgical technique) to ensure there is no reaction/stricture formation at the neo-ureterovesicular junction.
REFERENCES