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ECTOPIC URETERS: THE SURGEON'S APPROACH

Ectopic ureter, or *ureteral ectopia*, is a congenital anomaly in which one or both ureters empty outside the bladder. **Extraluminal (extramural) ectopic ureters** are those that completely bypass the bladder; **intraluminal (intramural) ectopic ureters** course submucosally in the bladder to open in the urethra or vagina. The most common location for termination of ectopic ureters is in the urethra, although termination in the uterus and vagina can occur. Ectopic ureters are classified as *intramural* (the ureter enters the bladder wall at a normal anatomic position, but a portion of the ureter extends submucosally within the bladder wall before it enters the urethral lumen or *extramural* (the ureter bypasses the bladder to enter the urethral lumen. Bilateral ectopic ureters occur in more than one-third of dogs (some reports have suggested more than 90%). Other abnormalities noted in some dogs include double ureteral openings (i.e., where the ureter opens in the bladder plus more distally and ureteral troughs. Ureteral ectopia is much less common in cats.

Ectopic ureters are more commonly diagnosed in female than in male dogs. Male dogs are also affected but may be less commonly diagnosed because the opening of the ectopic ureter is closer to the bladder than to the tip of the penis, and distal urethral pressures may prevent urine dribbling. Female dogs are usually diagnosed at a young age (median age, 10 months); however, males with ectopic ureters tend to be older at the time of diagnosis (12 to 24 months). Siberian huskies, golden retrievers, Labrador retrievers, Newfoundlands, English bulldogs, miniature Poodles, Swiss mountain dogs (in particular, Entlebuchers and Appenzellers), fox terriers, and soft-coated Wheaton terriers seem to have an increased incidence. Ureteral ectopia should be suspected in any young animal that has a history of incontinence (intermittent or continuous) since birth or weaning; however, this disease must be included as a differential in older animals with lifelong urinary incontinence, as well as in those that are poorly responsive to medications for incontinence. There are also isolated reports of ectopic ureters found in adult, continent dogs. Ectopic ureteroceles also cause urinary incontinence or may be associated with recurrent urinary tract infection without incontinence; ureteroceles have been intermittently reported in dogs and cats.

Surgical Technique

The entire urinary system should be explored before the ureter is repaired. Nonfunctional kidneys and their ureter should be removed; otherwise, the ureter and kidney should be preserved. If nephrectomy is considered, bilateral ectopia should be ruled out first. If nephrectomy is done, the end of the ectopic ureter should be ligated as close as possible to its termination.

Neoureterostomy

Handle the bladder tissue with extreme care, and use stay sutures whenever possible. Once the bladder has been emptied of urine, use sterile, cotton-tipped swabs rather than a sponge to absorb urine to prevent abrading the mucosal surface. Pediatric instruments may help reduce tissue trauma. Swelling or hyperemia makes the ureters difficult to locate beneath the mucosa. *Make an incision into the ventral bladder near the urethra. Place stay sutures to facilitate retraction of the bladder wall edges. Inspect the trigone for ureteral openings. Identify a submucosal swelling or ridge within the bladder wall; this may be facilitated by digitally occluding the urethra to cause ureteral dilation. Use a No. 11 or 15 scalpel blade to make a 3 to 5 mm longitudinal incision through the bladder mucosa into the ureteral lumen. Using 5-0 to 7-0 absorbable suture material, suture the ureteral mucosa to the bladder in a simple interrupted pattern. Place a 3.5 or 5 French catheter into the distal ureter. Just distal to the new stoma, pass one or two nonabsorbable sutures (3-0 or 4-0) from the serosal surface circumferentially around the tube, staying beneath the mucosa. Be sure the suture does not penetrate the bladder lumen. Use this suture to ligate the distal ureter after the catheter is removed.* Alternatively, the distal urethral segment can be resected; however, this has not been shown to decrease the incidence of postoperative incontinence. A novel technique for addressing the distal ureteral segment involves neoureterostomy with transection of the distal ureter, leaving the distal ureter in situ.

Ureteroneocystostomy

If the ureter is extraluminal, or if the submucosal tunnel of intramural ectopic ureters is difficult to identify, the ureter is resected and reimplanted into the bladder lumen. In dogs, the ureter may be implanted into the bladder with the use of a simple transverse pull-through or an intramural tunnel (3:1 tunnel length-to-ureteral orifice diameter).

The latter technique may cause less fibrosis and quicker return of normal ureteral function.

Perform a ventral cystotomy as described previously for neoureterostomy. Ligate the ureter and transect it, preserving as much length as possible. Place a stay suture on the proximal end of the transected ureter. Incise the bladder mucosa, and create a short, oblique submucosal tunnel in the bladder wall. Use the stay suture to draw the ureter into the bladder lumen to prevent damaging the ureter. Once the ureter is within the bladder lumen, the distal end should be excised; the remaining end of the ureter should be spatulated and then sutured to the bladder mucosa using 5-0 synthetic absorbable suture (e.g., poliglecaprone 25, glycomer 631) in a simple interrupted appositional pattern.

Prognosis

Past reports suggest that as few as 30% of patients are fully continent postoperatively; however, 72% of male and female dogs with surgically-corrected ectopic ureters were continent in a recent study. Labrador retrievers appear to have a better prognosis when compared to other breeds. Many dogs with ectopic ureters have functional abnormalities of the urinary bladder or urethra. Obtaining urethral pressure measurements before surgery and after initiating diethylstilbestrol, estriol, or phenylpropanolamine therapy may help predict the likelihood of continence after surgery. Siberian huskies are particularly prone to post-operative incontinence because of a high incidence of concurrent urethral sphincter incompetence. These dogs may respond to diethylstilbestrol, estriol, α-adrenergic agonists, or imipramine. If bladder hypoplasia is present, incontinence may continue until the bladder enlarges and properly functions as a reservoir. Dogs with ureteral troughs may have a poorer prognosis than dogs with nondistended intramural ectopic ureters. Failure to resect a ureterocele may result in continued incontinence and UTI.