

Subcutaneous ureteral bypass: is your patient a candidate?

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Ureteral obstruction is being increasingly recognised in cats and dogs, most often secondary to ureterolithiasis.¹ Less common causes include mucus plugs or solidified blood calculi, stricture, iatrogenic ligation, trauma, and neoplasia.² Ureteral calculi are detected more commonly in cats than dogs and are typically calcium oxalate in composition, meaning they cannot be dissolved medically.¹ Dogs with ureteral obstruction may present with clinical signs referable to the urinary tract, such as stranguria, pollakiuria, or polyuria. In contrast, cats often present with more nonspecific clinical signs such as weight loss, inappetence and vomiting. Although ureteral calculi may be identified on abdominal radiographs (see Figure 1), abdominal ultrasound is preferred for assessment of the urinary system. Dilatation of the renal pelvis, along with ureteral dilation secondary to a visible obstructive lesion, is diagnostic for ureteral obstruction (see Figure 2).

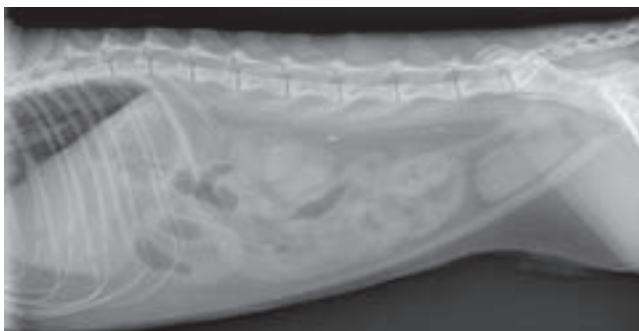


Figure 1: Lateral abdominal radiograph of a cat with multiple ureteroliths. Image courtesy: Claire Derooy.

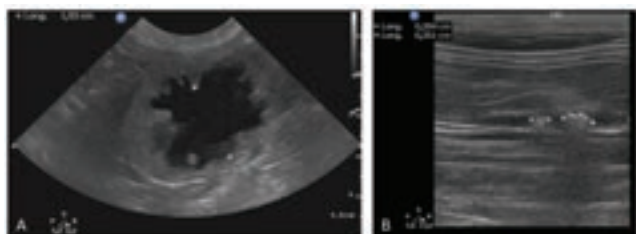


Figure 2: Ultrasound images of a cat with A) dilation of the renal pelvis consistent with ureteral obstruction and B) multiple ureteroliths with acoustic shadowing. Images courtesy: Claire Derooy.

In some cases, such as strictures or solidified blood calculi, an obstructive lesion is not identified within the ureter. In these situations, a renal pelvic height >13mm is considered consistent with obstruction, and in cats a ureteral diameter >6mm is highly suspicious.³ If routine imaging is

inconclusive and ureteral obstruction is suspected, antegrade pyelography or contrast computed tomography (CT) studies may be performed.

Treatment options for ureteral obstruction include medical management, traditional surgical techniques, and placement of stents or subcutaneous ureteral bypass devices (SUBs). Medical management consists of aggressive intravenous fluid therapy, diuretics, pain medication, and a tricyclic antidepressant (amitriptyline) or smooth muscle relaxant (prazosin). Although the reported success rate is low, medical management should be attempted for at least 24 hours, unless otherwise contraindicated, due to the risks involved with other interventions.⁴

Traditional surgical techniques include ureterotomy, neoureterocystostomy, and ureteronephrectomy. The feline ureter is extremely narrow (0.4mm luminal diameter), and a mortality rate of 18-21% is associated with ureteral surgery.^{4,5} Due to the morbidity and mortality associated with traditional ureteral surgery and the low success rate of medical management in cats, other treatment modalities have been investigated including nephrostomy tubes, ureteral stenting and, more recently, subcutaneous ureteral bypass (SUB).

WHAT IS SUB?

Subcutaneous ureteral bypass was first described over 20 years ago in humans with ureteral obstruction. A veterinary SUB device (Norfolk Vet Products) was adapted to bypass ureteral obstructions in dogs and cats, and is now available in many small animal specialty practices. The SUB device consists of three components; a locking-loop nephrostomy catheter placed in the renal pelvis, a cystostomy catheter placed in the apex of the bladder, and a subcutaneous shunting access port that connects the two catheters. The subcutaneous port allows for percutaneous access of the system for flushing and drainage (see Figure 3).



Figure 3: A) Subcutaneous ureteral bypass kit, and B) connection of the nephrostomy and cystostomy catheters with a port placed in the subcutaneous space. Images courtesy: Claire Derooy.

Urine, therefore, flows from the kidney through the shunting port in the subcutaneous space and into the bladder, bypassing the ureter (see Figure 4).

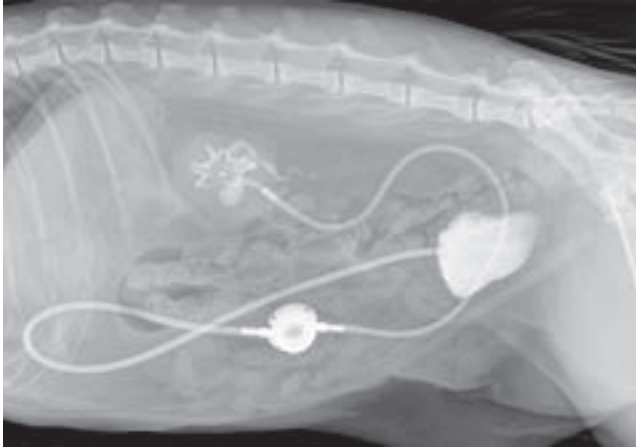


Figure 4: Post-operative lateral abdominal radiograph demonstrating contrast filling the SUB system. Image courtesy: Claire Deroy.

A 22-gauge Huber needle is used to prevent damage to the silicone diaphragm when flushing the shunting port or obtaining urine samples. The SUB device is available in two sizes; a smaller size is available for cats and small dogs, with a larger size for larger dogs. The device is placed via open laparotomy, either with or without fluoroscopic guidance.⁶

INDICATIONS

The most common indication for SUB placement is ureteral calculi causing ureteral obstruction in cats. Implantation of an SUB device has also been described to treat ureteral trauma, inadvertent ureteral ligation during ovariohysterectomy, and pyonephrosis in cats.⁷⁻⁹ Due to their larger size, traditional ureteral surgery and ureteral stent placement is more easily performed in dogs and is preferred to SUB. As dogs have higher rates of urinary tract infections, SUBs are typically reserved for dogs in which stenting has failed or for palliation of advanced urinary tract neoplasia.

PRE-SURGICAL CONSIDERATIONS

Several key points should be discussed with clients prior to surgery. Early intervention to relieve ureteral obstruction is advised in order to optimise recovery of renal function. Ideally, acute complete obstructions should be resolved within four days and partial obstructions within 14 days. However, in practice, it is impossible to predict how long a ureteral obstruction has been present and the resultant damage to the obstructed kidney. Specialist referral centres will typically have SUB devices in stock to facilitate urgent intervention once the patient has been stabilised. Many cats presenting with unilateral ureteral obstruction are azotaemic.¹ If serum creatinine is elevated with a unilateral ureteral obstruction, there must be concurrent bilateral renal disease. The ureteral calculi have simply ‘pushed the cat over the edge’. The owner must be made aware that relieving the ureteral obstruction will not resolve the underlying kidney

disease, the degree of which cannot be assessed accurately until after the obstruction has been relieved and the cat is adequately hydrated (prior to hospital discharge).

POST-OPERATIVE CARE AND OUTCOMES

Patients are typically hospitalised for three to five days following SUB placement. Serum creatinine is assessed daily until it has stabilised. Regular post-operative maintenance is necessary. Routine rechecks are scheduled at one-month postoperatively and then every three to six months. Bloodwork is obtained to check renal values and a urine sample is obtained from the port using a Huber needle for culture. The port is then flushed with sterile saline under ultrasound or fluoroscopic guidance.

Peri-operative complications include device leakage (3.4%), catheter kinking (5%), and occlusion of the device with a blood clot (7.5%). Long-term complications include catheter mineralisation (25%), with reobstruction requiring revision in 13%, and dysuria (8.2%).¹⁰ Urinary tract infections develop in 21% of cats within 10 days of SUB placement, with chronic infections in 10%.¹¹

The peri-operative mortality rate is reported at 6%, with overall survival considered good.^{10,12} Owners describe themselves as completely (90%) or mostly (10%) satisfied with having had the procedure performed.⁶

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TAKE-HOME MESSAGES

- Ureteral obstructions are being increasingly identified in cats and dogs, and are typically due to ureteral calculi.
- If ureteral obstruction is identified, prompt intervention is required to salvage kidney function.
- Due to the morbidity and mortality associated with medical therapy and traditional surgical techniques, SUB is now the preferred modality for treating ureteral obstructions in cats.
- In dogs, traditional surgical techniques and ureteral stents are still preferable to SUB, where possible.
- In cats, the outcome following SUB placement is good, although lifelong maintenance is required.

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