Minimally Invasive Management of Uroliths in Cats and Dogs

Andréanne Cléroux, DMV

KEYWORDS

• Urolith • Extracorporeal shockwave lithotripsy (ESWL)
• Endoscopic nephrolithotomy (ENL) • Basket retrieval • Laser lithotripsy
• Percutaneous cystolithotomy (PCCL) • Endourology

KEY POINTS

- Minimally invasive procedures are becoming more widely used for the management of upper and lower urinary tract uroliths in cats and dogs.
- Prevention strategies based on stone analysis results should be instituted following urolith removal to limit morbidity and mortality associated with stone recurrence.
- Operator training, careful patient evaluation, and case selection are essential to maximize treatment outcome and limit complications.

INTRODUCTION

Urolithiasis is defined as the formation of uroliths in the urinary tract. Extensive research has been directed at better understanding promotors of stone formation to develop targeted treatment and prevention strategies. In the presence of favorable conditions, urine supersaturation with ionic components of a particular stone type leads to crystal formation, aggregation and growth, and stone formation. Supersaturation of urine is primarily influenced by intrinsic patient factors, certain disease states, water balance, diet, urine pH, the presence of inhibitors of crystallization, aggregation and growth, as well as the presence of a scaffolding matrix.[1–4]

In human medicine, urolithiasis constitutes a health care problem in both adults and children, with a prevalence that is growing every year.[5,6] Considerable focus has been directed toward better understanding risk factors and establishing preventive strategies to improve outcome and reduce stone recurrence in these patients. Moreover, the morbidity and mortality associated with treatment of uroliths have decreased significantly with technical advancements that have led to a shift from open surgery to minimally invasive procedures. Minimally invasive techniques, such as shockwave

Disclosure: The author discloses no conflict of interest.
Department of Clinical Studies, School of Veterinary Medicine, University of Pennsylvania, 3900 Spruce Street, PA 19104, USA
E-mail address: clea@upenn.edu

Vet Clin Small Anim 48 (2018) 875–889
https://doi.org/10.1016/j.cvsm.2018.05.008
vetsmall.theclinics.com

lithotripsy, ureteroscopy, and percutaneous nephrolithotomy, are now standard of care techniques that constitute primary treatment options recommended by the American Urological Association and European Association of Urology for the management of stone disease in adult and pediatric patients.[7,8]

Following a similar trend, stone management has greatly evolved in veterinary medicine over the past decades, in part because of a better understanding of stone disease in cats and dogs, availability of better diagnostic tools, and also because of the adaptation and application of minimally invasive techniques used in human medicine to small animal patients. The American College of Veterinary Internal Medicine (ACVIM) guidelines for the treatment of uroliths in cats and dogs reflect modern techniques that prioritize the use of minimally invasive procedures with an emphasis on prevention strategies to limit stone morbidity and mortality.[9]

This article reviews minimally invasive techniques used in the management of upper urinary tract and lower urinary tract uroliths. The use of ureteral stenting and subcutaneous ureteral bypass devices for the management of benign ureteral obstructions is covered in Matthew W. Beal's article, "Interventional Management of Urethral Obstructions," in this issue.

UPPER URINARY TRACT UROLITHS

Calcium oxalate uroliths constitute approximately 90% of all nephroliths and ureteroliths in cats.[10,11] They also represent the most frequent type of upper urinary tract stones identified in dogs. A much higher incidence of struvite uroliths exists in this species, with a prevalence ranging between 20% and 30% of all nephroliths and ureteroliths.[12] These differences in stone composition are important to consider when making treatment and prevention recommendations. In canine and feline patients, most nephroliths seem to remain clinically silent and do not necessitate interventions.[9,13] Ross and colleagues[13] evaluated their long-term effects in cats with International Renal Interest Society stage II and III chronic kidney disease for a period of up to 2 years and found no significant impact of nephrolithiasis on disease progression and mortality. However, some nephroliths do become problematic and lead to complications such as urine flow obstruction with hydronephrosis or ureteropelvic junction obstruction, renal parenchyma compression caused by urolith growth, and discomfort, or may act as a nidus for infection, and they can be responsible for recurrent urinary tract infections. In such cases, medical dissolution or stone removal via minimally invasive techniques should be considered.[9,14] The ACVIM consensus recommendations on the treatment of uroliths in small animals recommends medical dissolution for the treatment of nonobstructive struvite nephroliths and ureteroliths. When obstructive, upper urinary tract struvite uroliths first need to be bypassed via ureteral stenting to relieve the obstruction and also allow medicated urine to reach and bathe the stone and for debris to be cleared.[9,14–17] The treatment of cystine and purine nephroliths or ureteroliths should be determined on a case-by-case basis and dissolution attempted when deemed appropriate.[9] Surgical interventions for the management of nephroliths, such as nephrotomy and pyelotomy, have largely been replaced by minimally invasive procedures adapted from human to veterinary patients, like endoscopic nephrolithotomy and extracorporeal shockwave lithotripsy (ESWL). Ureteral stent placement and subcutaneous ureteral bypass devices are used for the treatment of obstructive ureteroliths, and are discussed elsewhere in this issue. The reader should refer to the ACVIM small animal consensus recommendations on the treatment and prevention of uroliths in dogs and cats[9] for a comprehensive review of these recommendations.