

Urinary Stones Cause for Cystotomy Surgery

Associated Terms:

Bladder Stones, Ureteral Stones, Kidney Stones, Cystotomy, Urolithiasis, Cystic Calculi

OVERVIEW:

Urinary stones (*urolithiasis*) are a common condition responsible for lower urinary tract disease in dogs & cats. The formation of bladder stones (*calculi*) is **associated with precipitation & crystal formation of a variety of minerals**. Several factors are responsible for the formation of urinary stones. The understanding of these processes is important for the treatment & prevention of urinary stones. In general, conditions that contribute to stone formation include:

- a high concentration of salts in urine
- retention of these salts & crystals for a certain period of time in the urinary tract
- an optimal pH that favors salt crystallization
- a scaffold for crystal formation
- a decrease in the body's natural inhibitors of crystal formation.

The sequence of events that triggers stone formation is not fully understood. High dietary intake of minerals & protein in association with highly concentrated urine may contribute to increased saturation of salts in the urine. Disease conditions such as bacterial infections in the urinary tract can also increase urine salt concentration.

SIGNS/SYMPTOMS:

The signs that your pet may show **depends on the location of the urinary stones**. Most urinary stones are located in the urinary bladder or urethra & only a small percentage are lodged in the kidneys or ureters. Urinary stones can damage the lining of the urinary tract causing inflammation. This inflammatory reaction may predispose your pet to bacterial urinary tract infection (UTI).

UTI (Uriinary Tract Infection).

Signs of bladder stones may include:

- Abdominal discomfort
- Blood in the urine
- Straining to urinate
- Urinary accidents
- Urinating small amount frequently

URINARY STONE(s)/UROLITH(s)

Urinary stones may physically block the urine flow causing urinary obstruction that requires immediate emergency treatment.

Signs of urethral stones may include:

- Dribbling urine
- Straining or posturing to urinate with no urine production

If your pet is showing the above signs of a urinary obstruction, you should **seek veterinary attention immediately**.

KIDNEY/RENAL

Stones may also become lodged in the ureter (the portion of the urinary tract carrying urine from the kidney to the urinary bladder) causing an obstruction that results in serious kidney damage.

Signs of ureteral stones may include:

- Abdominal discomfort
- Blood in the urine
- Decreased appetite
- Lethargy
- Vomiting

DIAGNOSTICS:

Your primary care veterinarian will likely recommend **evaluation of your pet's blood & urine**. Urinary obstruction can cause heart rate & rhythm abnormalities seen on ECG. Identification of UTI associated with urinary stones requires culture NOT only of the urine but also of the bladder lining or the urolith (bladder stone).

Several diagnostic imaging tests can be performed to assess the urinary tract. **X-rays (radiography) & ultrasound** are the most commonly performed imaging techniques. Most, but not all, stones will show up on radiographs. Stones that do NOT show up well on plain radiographs may be diagnosed by introducing a contrast agent &/or gas into the urinary tract, usually through a urinary catheter.

Ultrasound examination can be very useful in evaluation of the kidneys, ureters & bladder but has limited ability to evaluate the urethra. Another technique that has been used more recently is nuclear scintigraphy (only available at specialty veterinary center), which provides a non-invasive method for analysis of renal blood flow & function.

Types of Urinary Stones

The stone type is named after its mineral composition. The most common stones are struvite (magnesium ammonium phosphate), calcium oxalate, urate, cystine, & silica.

Struvite Stones

The most common mineral type found in dogs is magnesium ammonium phosphate hexahydrate (struvite, Figure 2). This type of urinary stone accounts for **50% of all canine urinary stones**. The prevalence in **cats is around 30%**. Miniature Schnauzer, Miniature Poodle, Bichon Frise & Cocker Spaniel are the most affected breeds. Urinary tract infection is an important factor in the formation of struvite stones. The enzymatic action of some bacteria on urea increases the pH of the urine, which decreases the solubility of struvite crystals. Inflammation of the lining of the urinary bladder increases the amount of organic debris in the urine providing a surface for crystallization.

Calcium Oxalate Stones

In dogs, calcium oxalate stones (Figure 3) account for about **35% of all stones, while they account for 50-70% of feline stones**. Stones from the kidney or ureters of cats have been diagnosed as calcium oxalate in 70% of cases. Breeds that are most affected in dogs include Miniature & Standard Schnauzer, Miniature Poodle, Bichon Frise, Lhasa Apso, Yorkshire Terrier & Shih Tzu. Burmese, Persian & Himalayan cats are the feline breeds most commonly affected.

The cascade of events leading to calcium oxalate stone formation is largely unknown, but there is some indication that normal increases in urinary calcium concentration after feeding could be involved in stone formation. Decreased urine concentration of natural body crystal formation inhibitors & increased dietary intake of oxalate may also play a role in calcium oxalate stone formation.

Urate Stones

Urate stone (Figure 4) formation in dogs may result from two different mechanisms. One is related to the high excretion of ammonium biurate crystals in cases of Porto systemic shunts. Dalmatian dogs, which have a defective hepatic membrane transport of uric acid, will also frequently form urate stones. These stones may be difficult to visualize with an x-ray, but are observed easily with ultrasound.

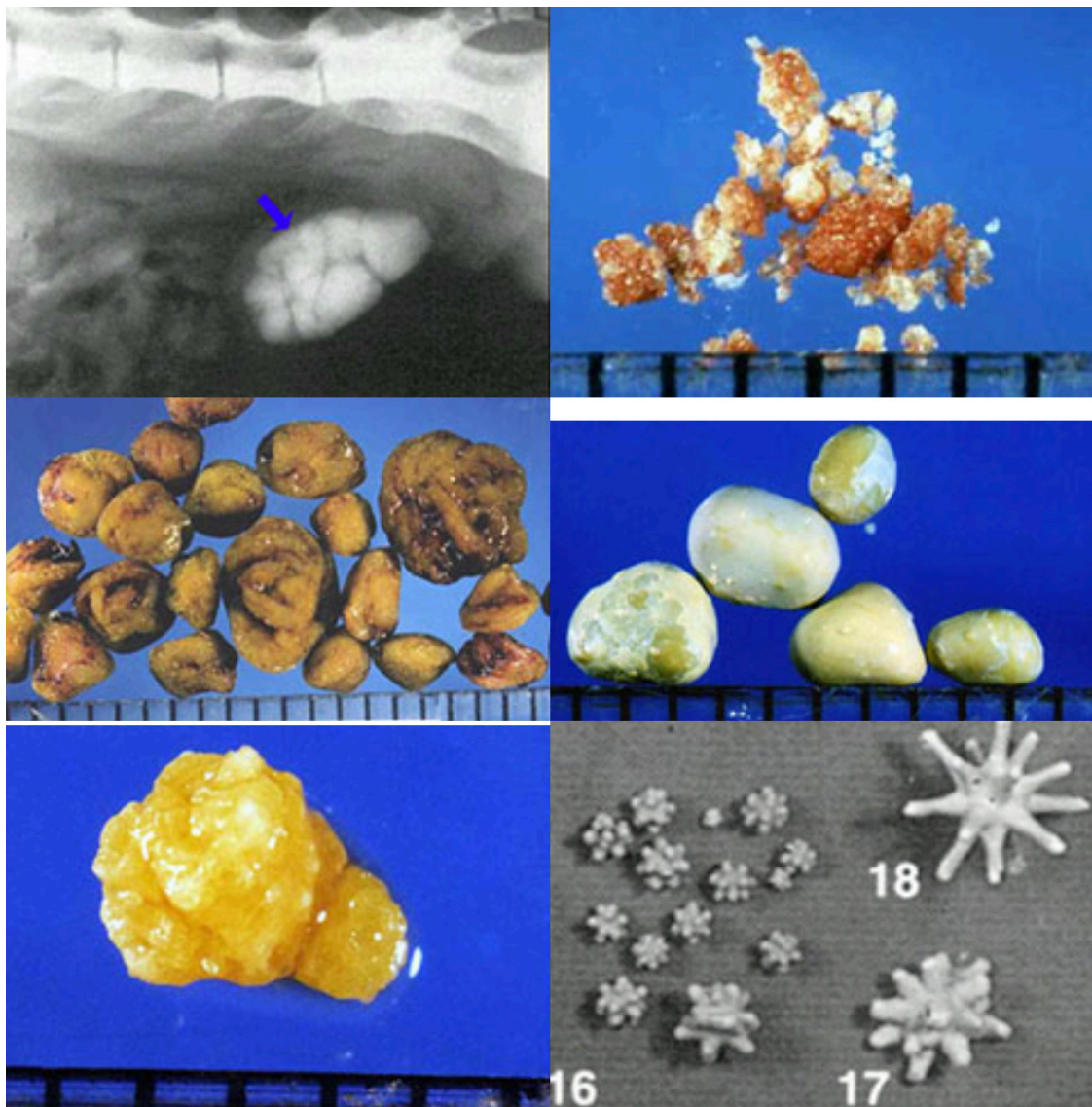
Cystine Stones

Excessive elimination of cystine in the urine is an inherited disorder of kidney tubular transport that is thought to be the primary cause of cystine stones (Figure 5). High concentrations of cystine in an acidic environment (low pH) can lead to stone formation. Male Dachshunds between the ages of 3 & 6 years old are most commonly

affected. Stones may be faintly visible on x-rays, but are most clearly visualized with ultrasound.

Silicate Stones

The mechanism of formation of silicate stones (Figure 6) is unknown; however, there may be a relationship between this type of stone & the dietary intake of silicates, silica acid & magnesium silicate. The formation of these stones has been linked to the consumption of large amounts of corn gluten & soy bean hulls which are high in silicates. German Shepherds, Old English Sheepdogs & Golden & Labrador Retrievers are the most affected breeds.



TREATMENTS

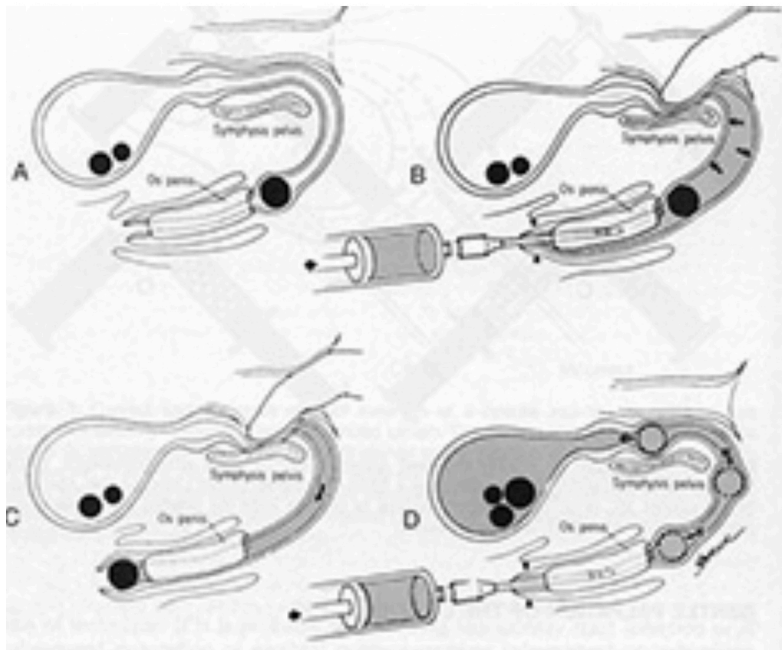
Medical Management

Calcium oxalate, urate, cystine & silicate stones **cannot be dissolved & require surgical treatment**. Struvite stones can occasionally be dissolved by using a commercially prepared diet (e.g., Hill's S/D) which is specifically formulated for this purpose. This diet is not intended for long-term use.

Medical Management of Urinary Obstruction

Urinary obstruction caused by stones lodged in the urethra is an **urgent or emergency situation**. The urinary obstruction must either be relieved to allow the bladder to empty, or the bladder must be drained by cystocentesis (a procedure where a needle is placed into the distended bladder through the abdominal wall, & the urine is removed with a syringe).

Stones lodged in the urethra can often be dislodged & forced back into the urinary bladder by flushing the urethra with a urinary catheter, a technique called retrograde urohydropulsion (figure below).



Surgical Treatments

The procedure for the surgical removal of urinary stones depends on where they are located in the urinary tract. The procedure for removing stones in the urinary bladder is

called a *cystotomy*. When stones are in the urethra, the procedure is called a *urethrotomy*. Occasionally a permanent opening is made to allow any further stones to pass without causing an obstruction. This procedure is called a *urethrostomy*. A common procedure in male cats that become obstructed is called a *perineal urethrostomy* (PU).

Laser lithotripsy is a minimally invasive method of stone removal that has been successfully utilized. This procedure requires advanced laser & endoscopic equipment. In some situations, the procedure can be performed through the urethra and, in other cases, a small incision is made in the urinary bladder & the endoscope & laser fiber are passed through this port & into the bladder & upper portion of the urethra. Laser lithotripsy is best utilized when there are urethral calculi or small numbers of cystic calculi.

Stones that develop in the kidney may be removed by a *nephrotomy*, *although most do not require surgical removal*. Ureteral stones, if causing a blockage to urine flow, may be removed by a *ureterotomy*. Alternatively to ureterotomy, a ureteral stenting procedure can be performed to allow urine to pass from the kidney to the bladder & bypass an obstruction. More specifically, subcutaneous ureteral bypass (SUB) systems are being used more commonly for this purpose. Many primary veterinarians will perform a cystotomy, however, many prefer to refer animals in need of a urethrotomy, urethrostomy, ureterotomy, ureteral stenting, or nephrotomy to a veterinary surgeon.

AFTERCARE/OUTCOME:

The exact aftercare will depend on the location of the stones & the procedure that your pet has undergone. Your veterinary surgeon will provide specific recommendations for you & your pet. In general, most pets recovering from urinary surgery should have **limited activity** for the first two weeks of healing. Your pet may need to wear an E-collar to prevent self-trauma to the surgery site. You should monitor your pet for the appropriate passage of urine after surgery, as well as a return to normal appetite & energy levels. It is common for pets to have a small amount of blood in the urine for the first week or two after urinary surgery. Many of these stones have a high recurrence rate.

Prevention

Struvite Stones

Your veterinarian will have specific recommendations for diets, as well as frequent monitoring of the urine. The treatment of any urinary tract infections is essential for the success of preventive measures.

Calcium Oxalate Stones

Your veterinarian will have specific recommendations for diets, as well as frequent monitoring of the urine.

Cystine Stones

Your veterinarian will have specific recommendations for diets, as well as frequent monitoring of the urine. The pH of the urine should be kept above 7.5. Your veterinarian may recommend a dietary additive to raise the pH of the urine.

Urate Stones

Your veterinarian will have specific recommendations for diets, as well as frequent monitoring of the urine. Dogs & cats with portosystemic shunts should have this condition addressed via either medical or surgical intervention. Dalmatians may benefit from a medication that modifies liver metabolism. Urate stones can be prevented in 80% of dogs & 95% of cats.

Silicate Stones

Your veterinarian will have specific recommendations for diets, as well as frequent monitoring of the urine. Diets with excessive silicates should be avoided.

AFTERCARE INSTRUCTIONS [CYSTOTOMY]

Your pet has had a cystotomy performed to explore the bladder & remove abnormal tissues or stones. This involved opening the abdomen & then the bladder; the bladder & urethra were evaluated for abnormalities & then the bladder was sutured closed. The bladder heals very rapidly, so is expected to be strong & functioning normally within 1-2 weeks. After bladder surgery, the inflammation created by the incisions & manipulation will make your pet feel like he/she has to urinate frequently; this will subside over the next week or so. No long-term problems are expected following a cystotomy, although stone disease (if present) can be recurrent.

ACTIVITY RESTRICTIONS

1. Please keep your pet in a comfortable, safe indoor location for the next 24 hours until he/she is very steady on his/her feet. Do not allow free access to stairs.
2. Your pet may be groggy for the next few days. He or she may whine or appear more anxious than usual; this may indicate pain/discomfort or side-effects of the medications. Please call your veterinarian for assistance with medication adjustments or return for exam & additional pain medications as needed.
3. Avoid any rigorous activity for 2 weeks. Short, leashed walks are fine.
4. Monitor appetite & attitude. If both do not steadily improve over the next 2-3 days, please call your veterinarian or return for progress evaluation & problem-solving.
5. You can expect your pet to have urgency to urinate frequently & to have blood-tinged urine for 1-2 weeks. Please allow frequent access to the outdoors to urinate. If your pet has accidents in the house, please understand that he/she likely could not prevent it during this recovery period—have patience. If this increased frequency or bloody urine continues beyond 2 weeks, please return to your veterinarian for evaluation.

INCISION CARE

1. Please look at the incision on your pet's abdomen twice daily. It should be dry, slightly red along the margins, & slightly swollen/thick on the edges. Over several days, it should lose redness & swelling.

2. Problems to call your veterinarian about:

--gapping (the edges should be exactly touching) --discharge (other than small amount of crusting) --swelling (other than slightly raised skin near edges). Some bruising is normal & will resolve in 5-7 days.

3. Do not allow your pet to lick or chew the incision. Pets tend to want to lick early in the healing period & this can compromise the incision & predispose to infection. If necessary, please use an E-collar if you must leave your pet unattended.

TESTS PENDING

1. If there were any stones removed, they will be submitted for analysis of their composition. Specific dietary modifications & therapy recommendations will be determined from this result. Your veterinarian will contact you with stone results in 2-4 weeks & will make any treatment changes as needed.

2. If there were any tissues removed for biopsy analysis, they will be submitted & results will be available in 5-7 days. Your veterinarian will contact you with biopsy results & will make any treatment changes as needed.

DIET

1. (If stones were removed). Until stone analysis results are returned, please follow the following general recommendations:

2. Encourage water consumption. Provide easy access to fresh water daily. Add 1/2-1 cup of water to food daily.

3. Avoid any dietary supplements (i.e. vitamins, etc.) or edible treats (i.e. biscuits, rawhide, etc.)

PROGRESS EXAMS

Please return to your primary care veterinarian in 10-14 days for a progress exam. Skin healing will be evaluated, sutures (if present) will be removed & any questions you have or tests needing follow-up will be addressed.

If you have any questions, please feel free to ask your primary veterinarian &/or veterinary surgeon.

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