

Urolithiasis

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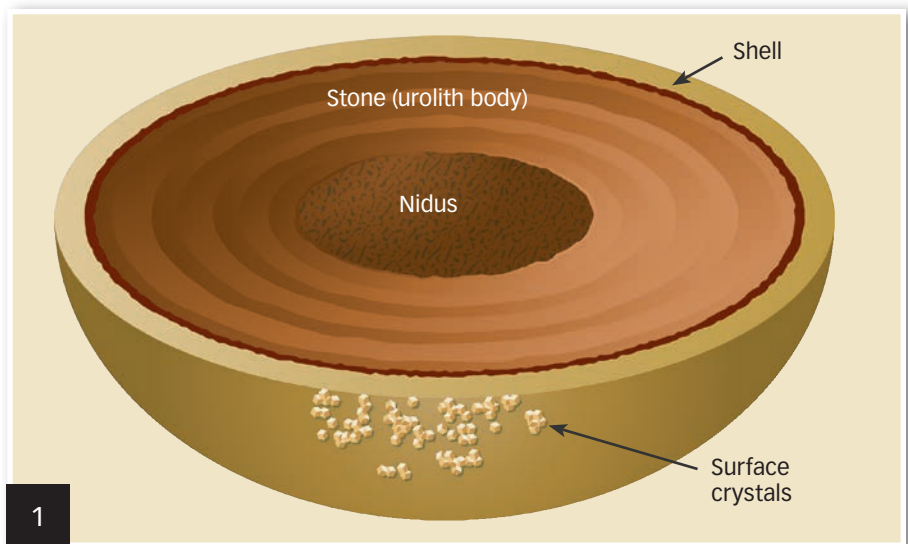
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Nephroliths

- Clinical signs are often absent, although hematuria without lower urinary tract signs may be observed (see **Diagnostic Imaging & Clinical Signs**, next page).
- Calcium oxalate and struvite are the most common nephroliths.

Calcium Oxalate

- Most common in older cats
- Renal diets may slow or prevent further growth. Urinary tract infection (UTI) must be ruled out (ie, urinalysis, urine culture and sensitivity).
- Management
 - Monitoring (with imaging) renal function and nephrolith size and location
 - Invasive treatment is not recommended if urolith size and location remain stable.
 - If nephroliths cause an obstructive uropathy (diagnosed with ultrasonography [pyelectasia/hydronephrosis] ± antegrade pyelography) or bacterial pyelonephritis (diagnosed with ultrasonography [pyelectasia] ± cytology and culture of urine and/or renal pelvic fluid aspirate), consider:
 - Extracorporeal shock-wave lithotripsy
 - Surgery (nephrotomy/pyelotomy); nephron damage



Uroliths are often composed of a nidus or nucleus, body, shell, and possibly surface crystals. In urolith analysis, all components should be considered when directing treatment and prevention. For example, a calcium oxalate nidus and body may later develop a struvite shell and struvite surface crystals secondary to a complicating UTI; in this case, after the stone has been removed and the UTI eradicated, treatment strategies should target prevention of calcium oxalate urolith recurrence.

and decreased renal function may occur.

Struvite (Magnesium Ammonium Phosphate)

- Management
 - Medical dissolution diets and long-term antibiotic treatment based on urine culture and sensitivity results
 - Extracorporeal shock-wave lithotripsy
 - Surgery (nephrotomy/pyelotomy); nephron damage and decreased renal function may occur.

Ureteroliths

- Most common ureterolith is calcium oxalate, especially in older cats with chronic kidney disease.
- Ureteral obstruction may be the cause of an acute-on-chronic crisis.

Calcium Oxalate

- Management
 - Noninvasive medical management includes rehydration, correction of electrolyte and acid-base imbalances, promotion of urolith migration toward the bladder (eg, CRI

UTI = urinary tract infection

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mannitol to induce diuresis, prazosin, glucagon, amitriptyline).

- ❑ Pain management
- ❑ Ureteral stent placement
- ❑ Nephrostomy tube placement
- ❑ Surgery (ureterotomy)
 - Ureteral stricture is a common complication.
 - Surgery is contraindicated if the ureterolith is migrating, azotemia is decreasing, or the kidney is already dysfunctional.

Cystouroliths

- Common clinical signs include pollakiuria, dysuria/stranguria, hematuria, and periuria.
- Can be subclinical

- Most common cystouroliths are struvite, calcium oxalate, urate, calcium phosphate, cystine, and silicate.
- Determining urolith type helps guide management options (Figure 1, previous page; Table).
- Complications of cystouroliths may include UTI, polyps, and obstructive uropathy.
- Management
 - ❑ Medical dissolution (struvite, urate, cystine)
 - ❑ Cystotomy
 - ❑ Voiding hydropulsion (depends on urolith size, shape)
 - ❑ Catheter retrieval (depends on urolith size, shape)
 - ❑ Basket retrieval (depends on

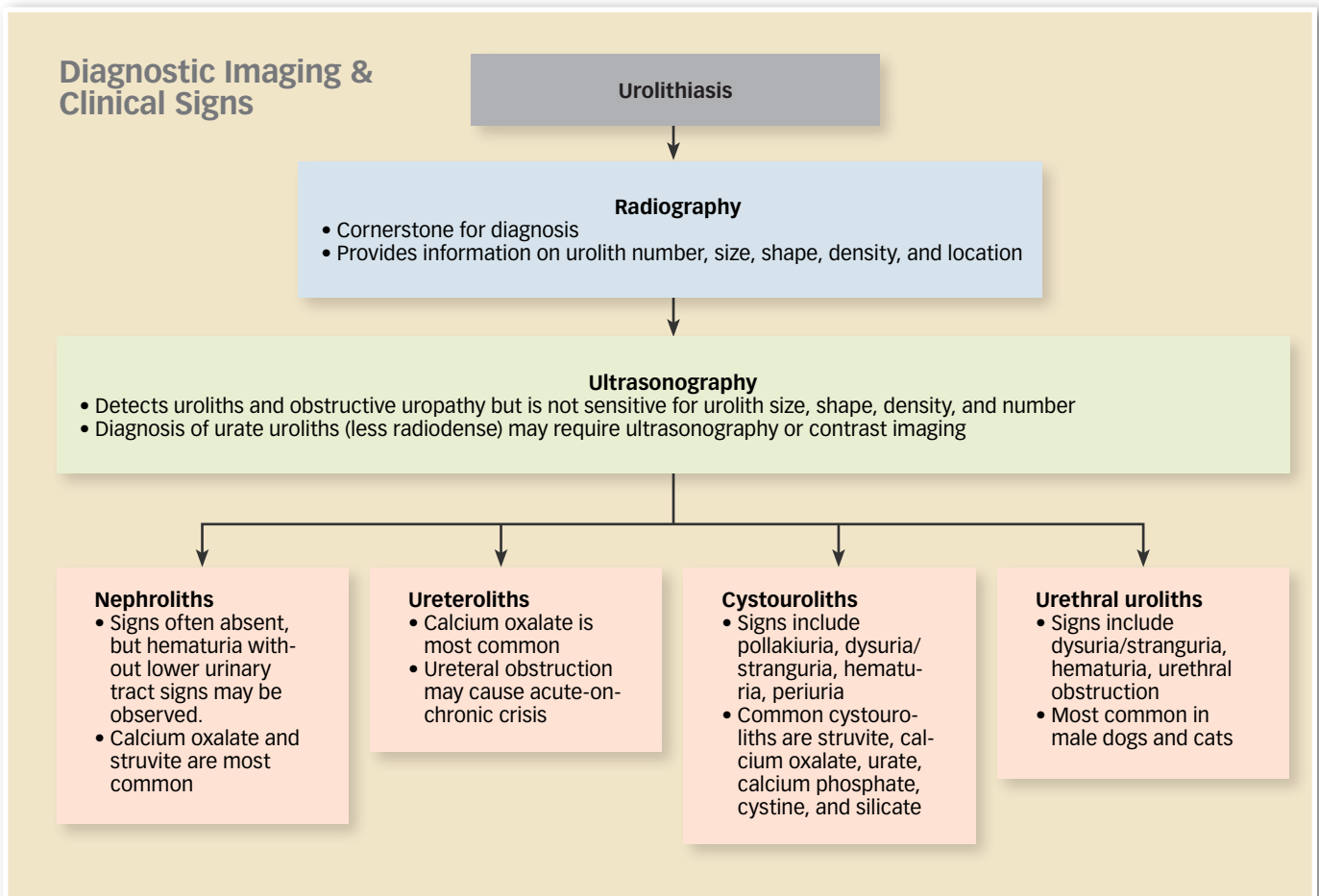
urolith size, shape)

- ❑ Lithotripsy

Urethral Uroliths

- Most common in male dogs and cats
- Clinical signs include dysuria/stranguria, hematuria, and urethral obstruction.
- Management
 - ❑ Retropulsion followed by cystotomy
 - ❑ Antegrade voiding hydropulsion
 - ❑ Lithotripsy
 - ❑ Urethral stent placement
 - ❑ Cystostomy tube placement ■ **cb**

See **Aids & Resources**, back page, for references & suggested reading.



UTI = urinary tract infection

Table Canine Urolithiasis: Factors That Help Predict Urolith Composition¹

Urolith Type	Radiographic Density (1–3 scale)	Usual Urine pH	Urinary Tract Infection	Gender Predisposition	Commonly Affected Breeds	Commonly Affected Ages (years)	Clinical Pathology Abnormalities
Struvite (magnesium ammonium phosphate)	2.5	Neutral–alkaline	Very common, especially urease-producing bacteria (eg, <i>Staphylococcus</i> , <i>Proteus</i> spp)	Females (>80%)	Miniature schnauzer, bichon frise, cocker spaniel, miniature poodle	1–8	Usually none
Calcium oxalate	3	Acid–neutral	Rare	Males (>70%)	Miniature schnauzer, miniature poodle, Yorkshire terrier, Lhasa apso, bichon frise, shih tzu	5–12	Occasional hypercalcemia
Calcium phosphate	3	Alkaline–neutral	Rare	Males (>60%)	Yorkshire terrier, miniature schnauzer, cocker spaniel	7–8	Hypercalcemia may be present
Urate	1	Acid–neutral	Uncommon	Males (>85%)	Dalmatian, miniature schnauzer (PSS), Yorkshire terrier (PSS)	1–4	Decreased serum BUN and albumin concentrations and abnormal pre- and postprandial bile acids with PSS
Cystine	1.5	Acid	Rare	Males (>90%)	Dachshund, Basset hound, English bulldog, Yorkshire terrier, Irish terrier, Rottweiler, Chihuahua, mastiff	3–5	Usually none
Silicate	2.5	Acid–neutral	Uncommon	Males (>90%)	German shepherd dog, golden retriever, Labrador retriever	4–9	Usually none

PSS = portosystemic shunt