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 March 2014 • Clinician’s Brief, pg 27). Consultation on Call

**Profile**

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 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 March 2014 • Clinician’s Brief, pg 27).
Urolithiasis

Consultant on Call

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 hydropropulsion (depends on urolith size, shape)
  - Catheter retrieval (depends on urolith size, shape)
  - Basket retrieval (depends on urolith size, shape)

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

Cystouroliths

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

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 hydropropulsion
  - Lithotripsy
  - Urethral stent placement
  - Cystostomy tube placement

Nephroliths

- Signs often absent, but hematuria without lower urinary tract signs may be observed.
- Calcium oxalate and struvite are most common

Ureteroliths

- Calcium oxalate is most common
- Ureteral obstruction may cause acute-on-chronic crisis

Cystouroliths

- Signs include pollakiuria, dysuria/stranguria, hematuria, periuria
- Common cystouroliths are struvite, calcium oxalate, urate, calcium phosphate, cystine, and silicate

Urethral uroliths

- Signs include dysuria/stranguria, hematuria, urethral obstruction
- Most common in male dogs and cats

Diagnostic Imaging & Clinical Signs

Radiography
- Cornerstone for diagnosis
- Provides information on urolith number, size, shape, density, and location

Ultrasoundography
- Detects uroliths and obstructive uropathy but is not sensitive for urolith size, shape, density, and number
- Diagnosis of urate uroliths (less radiodense) may require ultrasonography or contrast imaging

Nephroliths
- Signs often absent, but hematuria without lower urinary tract signs may be observed.
- Calcium oxalate and struvite are most common

Ureteroliths
- Calcium oxalate is most common
- Ureteral obstruction may cause acute-on-chronic crisis

Cystouroliths
- Signs include pollakiuria, dysuria/stranguria, hematuria, periuria
- Common cystouroliths are struvite, calcium oxalate, urate, calcium phosphate, cystine, and silicate

Urethral uroliths
- Signs include dysuria/stranguria, hematuria, urethral obstruction
- Most common in male dogs and cats

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

PSS = portosystemic shunt