

## BASIC INFORMATION

### Description

Bladder stones (cystoliths, cystic calculi) are physical aggregations of minerals and other substances in the bladder. They may rub and irritate the lining of the bladder, increase the risk of bladder infection, or lodge in the urethra (the tube that carries urine from the bladder to outside the body), causing an obstruction.

### Causes

Several types of bladder stones occur in dogs. Struvite stones (triple magnesium phosphate), occur in the presence of bladder infections. Female dogs are predisposed to struvite stones. Calcium oxalate stones occur with higher frequency in certain breeds of dogs, such as the miniature schnauzer, shih tzu, bichon frise, Lhasa apso, Yorkshire terrier, and miniature poodle. They may also develop secondary to other diseases, such as hyperadrenocorticism (Cushing's disease) or hypercalcemia (high blood calcium). Urate stones occur with liver problems, such as portosystemic vascular shunts and other inherited defects of the liver. The Dalmatian and English bulldog breeds are predisposed to urate stones. Other types of stones, such as cystine, calcium phosphate, xanthine, and silica stones, are rarely encountered.

### Clinical Signs

Signs of bladder stones include frequent urination and urgency, voiding of only small volumes of urine, and pain on urination. Blood may occur throughout the urine stream or may be worse at the end of urination. Bladder stones may lodge in the urethra, causing blockage. Urinary obstruction from stones is more common in male dogs. Signs include straining to urinate without producing any urine and abdominal pain. Urinary obstruction is an emergency situation.

### Diagnostic Tests

Diagnostic steps that are often recommended include routine blood and urine tests (urinalysis, culture) and abdominal x-rays. Urinalysis may show microscopic crystals. It is important to note that dogs can have crystals in their urine without having stones, and they can have stones without having crystals. Urine culture is important, because urinary infections may cause stones, and stones may cause infection.

Struvite and calcium oxalate stones show up on plain x-rays, making x-rays an excellent screening test. Some very small stones and stones of other types may not be apparent on x-rays, but an abdominal ultrasound can usually detect them.

Analysis of stones is necessary to be sure of their composition, so stones that are physically removed from the bladder are submitted for analysis.

## TREATMENT AND FOLLOW-UP

### Treatment Options

Struvite stones can often be dissolved with a special diet (Hill's S/D) and control of any underlying infection with antibiotics. The dog must eat this diet exclusively; no supplemental treats or other foods are allowed. On average, it takes 1-3 months to dissolve struvite stones.

Calcium oxalate stones cannot be dissolved with dietary changes or medications. The only effective therapy is physical removal of the stones, which generally means bladder surgery (cystotomy) done through an abdominal incision. In certain cases, particularly in female dogs with a solitary stone, the stone can be fragmented with a laser during cystoscopy (passage of a small fiberoptic viewing scope into the bladder) and the fragments flushed out. However, few veterinary hospitals have the equipment needed for cystoscopy and laser therapy. Surgery is generally a faster procedure. If the dog is a female and the stones are small, it may be possible to flush them out with the animal under anesthesia. After removal, the urine is kept dilute (watery) by feeding moist food, and urine pH is maintained in the alkaline range to help prevent recurrence.

With other types of stones, medications may be useful for dissolving them or preventing recurrence. For urate stones in Dalmatians, a special diet (Hill's U/D) and the oral drug, allopurinol, may help dissolve stones and prevent recurrences.

### Follow-up Care

After removal or dissolution of struvite stones, monitoring for infection with urine cultures is recommended on a monthly basis until three negative cultures in a row are obtained. Because urate stones do not show up on plain x-rays, ultrasounds are needed to monitor for recurrence.

Following surgery to remove calcium oxalate stones, a recheck visit is usually scheduled at 10-14 days for suture removal. Future rechecks consist of urinalyses and x-rays at 1, 3, and 6 months, then every 6 months thereafter. The goal is to detect recurrence of stones while they are small enough to flush out, without the need for surgery.

### Prognosis

Bladder stones can be removed surgically, leading to full recovery. Certain types of stones may recur, but appropriate preventive measures may work for years.