

## BASIC INFORMATION

### Description

Kidney stones are formed in the kidney. They may remain in the kidney without causing obvious problems; they may lead to progressive kidney damage; or they may block the outflow of urine from the kidney, resulting in a nonfunctional kidney. Kidney stones can also pass into the ureter, the tube that carries urine from the kidney to the bladder. Once in the ureter, they may pass all the way to the bladder or become lodged in the ureter, leading to acute kidney failure.

### Causes

Most kidney stones in cats are calcium oxalate or other calcium-containing stones. Although other types of stones are possible, they are rarely encountered in the kidney. Over the past 10-15 years, the incidence of kidney stones in cats has increased, for unknown reasons.

### Clinical Signs

Kidney stones may be discovered incidentally when x-rays are taken for other reasons. About half of cats with chronic kidney disease have kidney stones. The stones are likely to be seen on x-rays or on an ultrasound that is performed to evaluate the kidneys. Whereas severe pain is a common feature of passing kidney stones in people, passage of stones does not seem to be a painful condition in most cats. If the stone blocks the ureter, however, swelling of the kidney can be quite painful, making the cat uncomfortable when it is picked up.

Signs of a sudden blockage to urine flow include a decrease in appetite, lethargy, and possibly vomiting. Even with a blockage, some cats continue to make urine from the other kidney. For kidney failure to occur, both kidneys must be affected. In some cats, one kidney is damaged and becomes nonfunctional, but this goes undetected because the other kidney is working well. Then, when the remaining functional kidney becomes blocked, the cat suddenly goes into kidney failure.

### Diagnostic Tests

Incidental kidney stones are found on abdominal x-rays or an ultrasound. X-rays are better at showing stones in the ureters; an ultrasound is better at identifying evidence of blockage of urine flow. When kidney failure is present, laboratory tests often reveal elevations in blood urea nitrogen, creatinine, and potassium levels, as well as other abnormalities.

If it is suspected that kidney stones are blocking urine flow, a series of x-rays (excretory urography) may be taken after administration of a contrast material (a dye that shows up white on x-rays). In some cases, the contrast material is given intravenously (IV). If the kidney is thought to be completely blocked, the contrast material may be injected directly into the kidney under anesthesia. Occasionally, computed tomography (CT scan) is needed to see smaller stones or multiple stones.

## TREATMENT AND FOLLOW-UP

### Treatment Options

Not all kidney stones require removal. Sometimes, removing the stones can cause more damage to the kidney than leaving them in place. Stones are usually removed if they are blocking urine flow, causing infections, or enlarging in size (despite appropriate diets and medications). Surgical removal may also be performed if the stones are lodged in the ureter. Because cat ureters are very small, surgery is challenging, and magnification is necessary. Surgery may require referral to a veterinary surgery specialist.

Another treatment, lithotripsy, involves shattering the stones into fragments that are small enough to pass on their own. Few veterinary hospitals have the ability to perform lithotripsy on cats. There is also a chance of bruising the kidney with this treatment. If the stones cannot be removed, it may be possible to insert a tube from the kidney to the bladder that bypasses the stones and allows urine to flow freely.

Treatments to decrease formation of new stones include feeding a canned diet, increasing water intake, and, possibly, medications to make the urine alkaline.

### Follow-up Care

For cats with asymptomatic kidney stones, abdominal x-rays or an ultrasound, blood tests, a urinalysis, and a urine culture are usually performed every 3-6 months. If the stone is obstructing urine flow or causing kidney failure, monitoring frequency depends on the severity of the problem.

### Prognosis

The presence of nonobstructing kidney stones in cats with chronic kidney disease does not appear to affect their survival time. In cats with kidney stones that are causing blockage, removal of the stones improves survival compared to medical management. About 80% of cats with stones removed live for more than 2 years, whereas only 66% of cats treated with medical management live more than 2 years.