



Bladder Stone Removal (Cystic Calculi)

Bladder Stones in Dogs

What are bladder stones?

Bladder stones (*uroliths* or *cystic calculi*) are rock-like formations of minerals that develop in the urinary bladder. There may be a large, single stone or a collection of stones that range in size from sand-like grains to gravel. It is common for a mixture of both small and large stones to be present.

What other kinds of stones are there?

Gall stones form in the gall bladder and contain bile salts. Kidney stones are mineralized formations that develop in the kidney. Neither of these are directly related to bladder stones. Even though the kidneys and urinary bladder are both part of the urinary system, the development of kidney stones is not usually linked to the development of bladder stones. All stones form as a result of disease or inflammation in the affected structure.

What are the clinical signs of bladder stones?

"The most common signs that a dog has bladder stones are *hematuria* (blood in the urine) and *dysuria* (straining to urinate)."

The most common signs that a dog has bladder stones are *hematuria* (blood in the urine) and *dysuria* (straining to urinate). Hematuria occurs because the stones rub against the bladder wall, irritating and damaging the tissue and causing bleeding. Dysuria may result from inflammation and swelling of the bladder walls or the urethra, from muscle spasms, or due to a physical obstruction to urine flow caused by the presence of the stones. Veterinarians assume that the condition is painful, because people with bladder stones experience pain, and because many clients remark about how much better and more active their dog becomes following surgical removal of bladder stones.

Large stones may act almost like a valve or stopcock, causing an intermittent or partial obstruction at the neck of the bladder, the point where the bladder attaches to the urethra. Small stones may flow with the urine into the urethra where

they can become lodged and cause an obstruction. If an obstruction occurs, the bladder cannot be emptied fully. This is extremely painful, especially when pressure is applied to the abdomen. If the obstruction is not relieved, the bladder may rupture. A complete obstruction is potentially life threatening and requires immediate emergency treatment.

How did my dog get bladder stones?

There are several theories of how bladder stones form. The most commonly accepted theory is called the *Precipitation-Crystallization Theory*. This theory states that one or more stone-forming crystalline compounds is present in elevated levels in the urine. This may be due to dietary factors or due to some previous disease in the bladder, especially a bacterial infection. Sometimes the condition may be due to a problem with the body's metabolism. When the amount of this compound exceeds a threshold level, the urine becomes *saturated* and cannot hold any more of the compound. The saturation level depends on the specific minerals that are present and the pH of the urine. The excess precipitates out of solution and forms tiny crystals. The sharp crystals irritate the bladder lining, causing a production of mucus. The crystals and mucus stick together, forming clusters that gradually enlarge and harden into stones. This is similar to the way "rock candy" is formed.

How quickly can bladder stones form?

"Bladder stones can develop in a period of weeks to months."

Bladder stones can develop in a period of weeks to months. Speed of growth will usually depend on the quantity of crystalline material present and the degree of infection present. Although it may take months for a large stone to grow, some sizeable stones have been documented to form in as little as two weeks.

How are bladder stones diagnosed?

The symptoms of bladder stones are similar to those of an uncomplicated bladder infection or cystitis. Most dogs that have a bladder infection do not have bladder stones. Therefore, we do not conclude that a dog has bladder stones based only on these common clinical signs.

Some bladder stones can be palpated (felt with the fingers) through the abdominal wall. However, failure to palpate them does not rule them out. Some stones are too small to be felt in this manner, or the bladder may be too inflamed and painful to allow palpation.

"Most bladder stones are visible on radiographs (x-rays) or an ultrasonic bladder examination."

Most bladder stones are visible on radiographs (x-rays) or an ultrasonic bladder examination. These diagnostic imaging techniques should be performed on dogs that show signs of abdominal pain or have recurrent episodes of cystitis.

Some bladder stones are *radiolucent*, or are not visible on radiographs because their mineral composition does not reflect x-ray beams. They can be detected by an ultrasound examination or with a *radiographic contrast study*, a special x-ray technique that uses dye or contrast material to outline the stones within the bladder.

How are bladder stones treated?

There are three options for treatment. The stones can be removed by *cystotomy*, or surgically opening the bladder. This surgery is routinely performed by many veterinarians and dogs usually make a rapid post-operative recovery. Dogs with a complete urethral obstruction require immediate life-saving surgery. Surgery may not be the best option for patients that have other health concerns.

The second option is to attempt to dissolve the bladder stones with a special dissolution diet. This avoids surgery and can be a very good choice for some dogs. However, it has three disadvantages:

- It is not successful for all types of stones. Stone analysis is necessary to determine if it is the type of stone that can be successfully dissolved. This may not be possible in all cases.
- It is slow. It may take several weeks or a few months to dissolve a large stone so the dog may continue to have hematuria, dysuria, and recurrent infections during that time. The risk of urethral obstruction remains high during this period.
- Not all dogs will eat the special diet. These diets will not work unless they are fed *exclusively*.

In some selected referral centers, a third option may be available to remove bladder stones. This option is ultrasonic dissolution, in which high frequency ultrasound waves disrupt or break the stones into tiny particles that can then be flushed out of the bladder. Due to its lack of availability, this option is not widely used. It has the advantage of immediate removal of the offending stones without the need for surgery or general anesthesia.

Can bladder stones be prevented?

Prevention is possible in some cases, depending on the chemical composition of the stones. There are at least four types of bladder stones common in dogs and some of them are preventable.

"They should be analyzed for their chemical composition."

Whenever possible, bladder stones (either those that are removed surgically or those small ones that have been passed in the urine), they should be analyzed for their chemical composition. This will permit your veterinarian to determine if a special diet will be helpful in preventing recurrence. If the stones formed because of a bacterial infection, it is recommended that periodic urinalyses and urine cultures be performed to detect sub-clinical recurrences and determine if antibiotics should be prescribed. Periodic bladder x-rays or ultrasounds may be helpful in some cases to determine if bladder stones are recurring.

Early recognition may allow your veterinarian to resolve the problem before your pet requires surgery.

Bladder Stones in Cats

What are bladder stones?

Bladder stones (*uroliths or cystic calculi*) are rock-like formations of minerals that develop in the urinary bladder. There may be a large, single stone or a collection of stones that range in size from sand-like grains to gravel. Many times, there is a mixture of both large and small stones present.

What other kinds of stones are there?

Gallstones form in the gall bladder and contain bile salts. Kidney stones are mineralized formations that develop in the kidney. Neither of these is directly related to bladder stones. Even though the kidneys and urinary bladder are both part of the urinary system, the development of kidney stones is not usually linked to the development of bladder stones. All stones form because of disease or inflammation in the affected structure.

What are the clinical signs of bladder stones?

The most common symptoms of bladder stones in the cat are hematuria (blood in the urine) and dysuria (straining to urinate). Hematuria occurs because the stones rub against the bladder wall, irritating and damaging the tissues and causing bleeding. Dysuria may occur from inflammation and swelling of the bladder walls or the urethra, from muscle spasms or due to a physical obstruction to urine flow caused by the presence of the stones. Veterinarians assume that the condition is painful, because people with bladder stones experience pain, and because many clients remark about how much more active their cat becomes following surgical removal of bladder stones.

"The most common symptoms of bladder stones in the cat are hematuria (blood in the urine) and dysuria (straining to urinate)."

Large stones may act almost like a valve or stopcock, causing an intermittent or partial obstruction at the neck of the bladder, the point where the bladder attaches to the urethra. Small stones may flow with the urine into the urethra, where they become lodged and cause an obstruction. This problem occurs more frequently in male cats, because of their anatomy.

If an obstruction occurs, the bladder cannot be emptied fully. This is very painful, especially when pressure is applied to the abdomen. If the obstruction is not relieved, the bladder may rupture. A complete obstruction is potentially life threatening and requires immediate emergency treatment.

How did my cat get bladder stones?

"The most commonly accepted theory for stone formation is called the Precipitation-Crystallization Theory."

There are several theories of how bladder stones form. The most commonly accepted theory for stone formation is called the **Precipitation-Crystallization Theory**. This theory states that one or more stone-forming crystalline compounds are present in elevated levels in the urine. This may be due to abnormalities in **diet** or due to some previous disease in the bladder. When the amount of this compound exceeds a threshold level, the urine becomes *saturated* and cannot hold any more of the compound. The saturation level depends on the specific minerals that are present and the pH of the urine. The excess precipitates out of solution and forms tiny crystals. The sharp crystals irritate the bladder lining, causing a production of mucus. The crystals and mucus stick together, forming clusters that gradually enlarge and harden into stones. This is similar to the way "rock candy" is formed.

How quickly can bladder stones form?

Bladder stones can develop within a few weeks or may take months to form. The rate of urolith formation and growth is variable, depending on factors such as on how much crystalline material is present in the urine, the pH of the urine, etc.

How are bladder stones diagnosed?

Inflammatory diseases of the bladder are common in cats, and produce the same symptoms as bladder stones. Therefore, we do not assume that a cat has bladder stones based only on these clinical signs.

Some bladder stones can be palpated or felt with the fingers through the abdominal wall. However, failure to palpate bladder stones on examination does not rule them out because many are too small to be detected in this manner.

Most bladder stones are visible on radiographs (x-rays) or an ultrasonic bladder examination. These diagnostic imaging techniques should be performed on cats that show signs of abdominal pain or have recurrent episodes of hematuria or straining.

Some bladder stones are *radiolucent*, or are not visible on radiographs, because their mineral composition does not reflect x-ray beams. They can be detected by an ultrasound examination or with 'contrast radiographs' a specialized technique that uses dye or contrast material to outline the stones within the bladder.

How are bladder stones treated?

There are two options for treatment. The fastest solution is to perform a *cystotomy*, or surgically open the bladder and remove the stones. This routine surgery is the most common choice for most clients, and cats usually make a speedy post-operative recovery. Cats with a complete urethral obstruction caused by large stones require immediate surgical intervention. In some cases, a cystotomy may not be necessary if the obstruction can be relieved by passing a catheter, especially if it is caused by soft plugs of crystals and mucus or urethral spasms. Surgery is not the best option for patients that have other health concerns.

"The fastest solution is to perform a *cystotomy*..."

The second option is to dissolve the stone with a special diet. This avoids surgery and can be a good choice for some cats. However, it has three disadvantages:

- It is not successful for all types of stones. Unless some sand-sized stones can be collected from the urine and analyzed, it is not possible to know if the stone is of the composition that is likely to be dissolved.
- It is slow. It may take several weeks or a few months to dissolve a large stone so the cat may continue to have hematuria, dysuria, and recurrent infections during that time. The risk of life-threatening urethral obstruction is present during the dissolution process.
- Not all cats will eat the special diet. The diet is not as tasty as the foods that many cats are fed. If it is not consumed *exclusively*, it will not work.

Can bladder stones be prevented?

Prevention is possible in many cases. There are at least four types of bladder stones in cats, each based on their chemical composition. If bladder stones are removed surgically or if small ones pass in the urine, they should be analyzed for their chemical composition. This will permit us to determine if a special diet or medication is appropriate. Periodic urinalysis or ultrasound examination may be helpful in some cases to detect early recurrence of the problem and allow adjustments in diet or treatment.

If you have any questions, please feel free to contact us using the information below.
Thank You,



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