Crystalline Obstruction of the male Feline Urethra

John J. Andrews
Iowa State University

Follow this and additional works at: https://lib.dr.iastate.edu/iowastate_veterinarian

Part of the Small or Companion Animal Medicine Commons, and the Veterinary Physiology Commons

Recommended Citation
Available at: https://lib.dr.iastate.edu/iowastate_veterinarian/vol29/iss3/2

This Article is brought to you for free and open access by the Journals at Iowa State University Digital Repository. It has been accepted for inclusion in Iowa State University Veterinarian by an authorized editor of Iowa State University Digital Repository. For more information, please contact digirep@iastate.edu.
Crystalline Obstruction of the Male Feline Urethra

by John J. Andrews

Obstructive urolithiasis, or more correctly phosphocrystalluria (since calculi rarely occur in the feline kidney or ureter), occurs quite often in the male domestic cat. The female cat seems to escape this problem because her urethra is wider and more expansible. The male cat, however, has a relatively narrow penile urethra and fine urinary crystals may obstruct and pack this urethral canal. If this condition is left untreated death is the usual result. Even if treatment is initiated, permanent urinary tract damage may have already occurred or the condition may reoccur and plague both the pet owner and the pet for the rest of the cat's life.

ETIOLOGY

The cause of obstructive urolithiasis seems to be any factor that affects the urine concentration of phosphate ions, the pH of the urine, the diameter of the urethra or the integrity of the epithelial lining of the urethra. Some proposed specific causes thus include: 1) inadequate fluid intake; 2) infection of the urinary tract, especially by Proteus or Pseudomonas spp. since these organisms split urea to yield ammonia which increases the urine pH; 3) urinary stasis such as occurs in the house-broken cat; 4) castration of the immature male; and 5) trauma of the urethral lining.

Too much dietary ash has long been considered to be a cause of urolithiasis but recent experiments have not supported this claim. Likewise, hypovitaminosis A has not been supported as a cause by research experiments.

The material which forms the urethral obstruction in nearly all the cases of feline urolithiasis is "struvite" crystal conglomerations. Struvite (NH₄MgPO₄·6H₂O — ammonium magnesium phosphate hexahydrate) is found in three forms in the feline urinary tract: 1) sabulous or mucus-like plugs of fine struvite crystals mixed with some cellular debris; 2) "sand" or granular material of larger struvite crystals many in small clumps; and 3) "calculi," larger agglomerations of struvite crystals up to several millimeters in diameter. These can usually be easily crushed into smaller granules.

There are two physical-chemical properties of these crystals that are very important. One, these struvite crystals have a very regular rhomboid shape with perfect sharp edges. Therefore, the usual feline calculi is not a smooth rounded stone as you might find in the dog, but rather it is an irregular conglomeration of regular crystals which displays sharp jagged edges around its circumference. And two, in nearly ninety percent of the normal feline urine samples that had a pH reaction above 6.8, struvite crystals were found. The normal pH of feline urine varies from 6.0 to 7.4; not only in different cats, but also in the same cat at different times. The median urine pH was 6.4. Thus we can see that the probability of a male cat hav-
ing struvite crystals in his urine sometime during his life is quite high.

**CLINICAL SIGNS**

The usual clinical picture of urethral obstruction is a severely depressed cat that has been straining for a period of hours to days. A frequent comment by the owner is that the cat appears constipated because he has been sitting in his "kitty pan" straining, but no feces have been passed. There may also be some vomiting in the severely affected cat. The eyes are usually dull and the mucous membranes may be pale to "muddy." Palpation of the abdomen will easily reveal a tense thick walled bladder. Unless the cat is very depressed pain may be elicited upon palpation of the abdomen. In many cases the penis is protruded and the penile tip may be a purplish color.

**DIAGNOSIS**

The history of straining and the palpation of the distended bladder are usually sufficient for a diagnosis. This condition demands immediate treatment and therefore there is little time to differentiate obstructive urolithiasis from other conditions.

Other conditions that might later be considered in differentiation are a stenosis of the urethra or a neoplasm impinging upon the urethra. A radiograph of the pelvic area might be helpful in differentiating these conditions, however, crystal obstruction is so common this is probably not warranted.

A blood-urea-nitrogen test could be utilized as a prognostic test to determine the amount of kidney damage caused by the increased pressures in the urinary tract.

I would like to emphasize that immediate relief of the urinary stasis is more important than attempting to confirm the specific diagnosis. Proceed as if it were crystalline obstruction and you will be correct in a great majority of the cases.

**PATHOLOGY**

After crystals have lodged in and obstructed the urethra, the intravesicular pressure begins to rise. As this pressure increases the renal tubular secretion is severely reduced. Congestion and engorgement of the vessels in the bladder wall becomes marked as the urinary bladder distends beyond its normal distended size. This congestion gives the wall a thickened impression upon palpation. The vessels in the renal parenchyma also become congested. Copious amounts of blood and tissue debris appear in the urine arising from this engorgement and hemorrhage in the renal parenchyma, the degeneration of the renal papillae and later from degeneration and hemorrhage in the lower urinary tract. Blood in the urine is therefore a poor prognostic sign.

The blood-urea-nitrogen level is increased by the decreased tubular function. Also a certain amount of the retained urine seeps into surrounding tissues and is picked up by the capillaries and lymphatics, thus causing the B.U.N. to rise even more. This should be taken into account when the B.U.N. is being used as a prognostic tool.

Gross pathological changes include swollen bluish kidneys, a thickened severely congested bladder wall that may exhibit numerous hemorrhagic areas and presence of "sand" or "calculi" in the bladder and urethra.

Glycosuria has also been reported due to tubular damage.

**TREATMENT**

The treatment of feline urethral blockage can be divided into three areas: 1) immediate relief, 2) aftercare, and 3) surgical treatment.

**IMMEDIATE TREATMENT**

Since the diameter of the penile urethra from the prostate caudally is only one-half the diameter of the preprostatic urethra, nearly all calculi lodge in the penile portion with many lodging within one-half inch of the orifice. A parenteral smooth muscle relaxant can be given as soon as a diagnosis has been made. Its usefulness is questioned because of the slight amount of smooth muscle surrounding the penile portion of the feline urethra. Probably the only urethral relaxation obtained is in
the preprostatic portion where smooth muscle is more abundant. This may be of benefit if back-flushing of the urethra is used.

Next a gentle digital manipulation of the penis should be attempted; lightly rolling the penis between the forefinger and thumb, trying to dislodge or break-up the obstruction. Care must be taken so that further damage to the urethral mucosa is not caused. Even though many of these struvite calculi are quite easily crushed many veterinarians choose not to attempt this manipulation because of the possibility of causing further trauma. If the obstruction does not dislodge immediately upon digital manipulation (or if you choose not to use it) back-flushing of the urethra should be attempted.

Many of these affected cats are so depressed that manipulation and even back-flushing can be done without an anesthetic. In fact because the kidneys are practically non-functional, long acting barbituate anesthetics or any other anesthetics that are detoxified mainly by the kidneys are contraindicated. If chemical restraint is needed, a tranquilizer such as meperidine or trifluomeprazine usually gives adequate results. If an anesthetic is still needed, give an ultra-short barbituate to effect or give one of the inhalents such as methoxyflurane. These anesthetics and tranquilizers also give needed skeletal muscle relaxation; thus some penile urethral muscle relaxation is obtained.

Back-flushing of the urethra may be attempted using either a three-quarter inch 20g. blunt tip needle or a three-quarter inch silver lacrimal cannula (B.D. #43 LC) and a ten c.c. syringe filled with saline. An acid solution such as weak sulfuric acid, citric acid or the commercial buffered (to pH 4.0) citric acid product Renacidin (Guardian Labs.) could be used as a flush. These would have an added dissolving power saline lacks. Some veterinarians like to use a solution containing a topical anesthetic such as tetracaine. This gives pain relief in the urethra and therefore usually yields a more manageable patient. Large cannulas such as a “tom cat catheter” may be used but may prove to be too traumatic.

Careful flushing should attempt to break down and/or force the obstruction back into the bladder. If this procedure doesn’t succeed a 32g. stainless steel wire loop can be used. This can be made by twisting the wire upon itself and leaving a small loop at one end. This loop is then inserted into the urethra and a further attempt to disintegrate the obstruction is tried.

If all else fails, puncture of the bladder through the abdominal wall should be done. This is a “last resort” solution for two reasons: 1) it does not solve the primary problem, the obstruction (although the obstruction may now be easier to back-flush because of the release of the intravesicular pressure) and 2) there is a danger of contaminating the peritoneum with pathogenic bacteria leaking through the needle hole in the urinary bladder wall. A one-inch 22g. (or smaller diameter) needle is the safest size to use. As much urine as possible should be withdrawn. Once the bladder has been emptied another attempt to dislodge the obstruction should be made.

When the obstruction has finally been dislodged, the bladder should be flushed out thoroughly. If the bladder does not contract spontaneously (and this is often the case in cases of several days’ duration) gentle pressure through the abdominal wall may be needed to empty the bladder. Renacidin (Guardian Labs.) or another weak acid solution should then be flushed into the bladder. Infuse about 50c.c., let it stay a few minutes, then express it. Repeat this about four times and leave the last flush in the bladder overnight. This hopefully will rid the urinary bladder of the majority of the struvite crystals.

If the cat is still “open” the next morning but still has no bladder tone, 1.25mg. of bethanechol chloride (a smooth muscle stimulant) may be given orally. Make extra sure that the obstruction has not recurred, then express the bladder manually. After the acid has been expressed it is useful to infuse the bladder with 10 cc. of penicillin or chloramphenicol.

Because cystitis often exists in these
cases it is a good idea to culture and sensitivity-test the urine that is first removed from the bladder after the obstruction has been relieved. Later cultures may also be desirable.

**MEDICAL AFTERCARE**

Once the urethral obstruction has been removed the battle is just beginning. An intensive aftercare program is needed to prevent a recurrence of the problem. This care should probably be performed in the home as much as possible since many cats will not urinate in a hospital cage, especially the house-broken cats.

This program should include:

1) diet—A high protein diet with a high level of vitamins and a low mineral content is preferred. A high level of protein tends to acidify the urine. Salt (sodium chloride) should be sprinkled on the food to increase the fluid intake. Plenty of fresh water or milk should, of course, be available at all times.

2) urine acidifiers—These are used to prevent the formation of more struvite crystals; oral tablets of ethylene-diamine dihydrochloride, 3gr. b.i.d. (Chlor-Ethamine, Pitman-Moore) should be dispensed. Ammonium chloride (5gr. b.i.d.) or methionine (Methischol, U.S. Vitamins) can also be used to control the urine pH. Whichever one is used, it should be used for at least two to three weeks following the relief of the obstruction. Paper colorimetric pH indicators (pHydrion Papers, Micro Essential Labs., Inc.) may be dispensed also so the owner may periodically check the urine pH and use the acidifiers as needed.

3) antibiotics—If a cystitis exists a ten-day regimen of antibiotics will usually clear up the problem. Penicillin and chloramphenicol seem to be the most useful but sulfisoxazole, furadantin, nitrofuradantoin, sulfadimethoxine and tetracyclines have been used with success. Corticosteroid products have also been used to lessen the chance of a urethral stenosis due to scar formation.

4) combination products—Besides the fore-mentioned medications, antispasmodics, antiseptics, intravesical injections of hyaluronidase, and indwelling catheters have been used with variable success. Aspirin and other salicylates (1/2gr. b.i.d.) have also been used since salicylates are excreted in the urine as glucuronides and theoretically increase the stability of the urine phosphates in solution. A urinary antiseptic (or antibiotic), an antispasmodic and a salicylate are often combined in one tablet. Some of these useful products include Urised (Chicago Pharm.), Uriad (Haver-Lockhart), and Renachek (Diamond Labs.). Renachek does not contain a salicylate but does contain a urine acidifier, ammonium chloride (80 mg. per tablet). By using a suitable combination product struvite crystal obstruction of the urethra may be controlled with one tablet b.i.d. in a great many of these cases.

**SURGICAL TREATMENT**

If a medical program does not seem to give satisfactory results surgery may be attempted. Surgery, however, should not be attempted until the medical condition of the patient is satisfactory.

Many different surgical approaches have been done and the most satisfactory seems to be the perineal urethrostomy. This involves amputation of the penis just anterior to the bulbourethral glands and suturing the remaining urethra to the skin surrounding a surgical incision just below the anus. When the hair grows back after surgery the “new” orifice present a good appearance and client satisfaction seems to be excellent. About the only problem with this technique is constriction of the scar tissue at the suture line around the orifice. This constriction may be stretched daily with a fine mosquito forceps for several days and a permanent constriction may be avoided.

Other procedures that have been tried with some success have been: 1) scraping the bladder epithelium to remove all “sand”; 2) preputial urethrostomy, amputating the penis and then using the prepuce to guide the urine to the exterior (cystitis and urine scalds are frequent problems); 3) ureterocolostomy, suturing the ureters to the colon wall (ascending kidney infections and loose watery stools are frequent problems); 4) urethrocolos-
tomy, suturing the pelvic urethra to the colon wall (cystitis and soft stools are frequent problems); 5) antepubic urethrostomy, suturing the pelvic urethra to the ventral abdominal wall (urine scald and dribbling incontinence are frequent problems); 6) permanent indwelling catheter (urine incontinence and cystitis are frequent problems); and 7) bladder prothesis, similar to having a drain plug in the bladder to use when needed.

SUMMARY

In summary one should remember these important features of the treatment of feline urethral obstruction by struvite crystal conglomerations: 1) the need for a quick diagnosis and immediate relief of urinary bladder distention, 2) the need for an aftercare program best performed in the patient's home, including diet, antibiotics, urine acidifiers and combination products (antispasmodic, antiseptic, salicylate, and/or acidifier combinations); and 3) the usefulness of surgical intervention in problem cases.

BIBLIOGRAPHY


Do Dogs Watch TV?

Dogs may watch television, but they don't see what we see, according to experts at the Gaines Dog Research Center, New York . . . which may or may not make them luckier than mere humans. There are many opinions on the subject of whether or not dogs "view" t.v., but most agree that the dog does not see complete images on the screen. His eyes catch the moving black and white patterns, however it is very doubtful that he sees anything more than blurry movement.

The sound from a television set, on the other hand, does catch the dog's attention if it is of a particular kind. The same sounds which make Towser bark normally may make him bark when he hears them from the set. Auto horns, doorbells, knocks, dogs, or high pitched electronic noises are all attention getters for canines. Even some human voices can produce howls or "singing" from dogs whose particular sensitivity to sound has been touched.

Many people claim that their dog has a particular favorite among television programs or that their dog "watches Rin Tin Tin." Again, according to what is currently known, this can be explained by the dog's attraction to the sounds and rather blurred movements of shadowy figures. In this sense, the medium really is the message.