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Review on Canine Urolithiasis

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Abstract: Urolithiasisa is the medical term for the presence of stones (known as "uroliths") in the urinary tract. Canine urolithiasis is not a single disease, but is often secondary to one or more conditions. Urolith is formed in all the species of domestic animals, and is one of the important lower urinary tract diseases in dogs. Some affected dogs have no signs of disease (known as "asymptomatic") and signs depend on location, size, and number of stones (uroliths). The type of urolith is determined by quanti-tative stone analysis. Diet is an important factor in the prevention of Ca oxalate stones. Unlike many other diseases in most cases of urolithiasis in pet animal is asymptomatic, that result in difficult to recognize the problem recently. Taking the responsibility to the pet animals to improve their health problem is carrying out by the owners of the animals that followed by the doctors of veterinary medicine. Generally, the canine urolithiasis is the common disease of canine animals which makes the animals difficult to urinate and suffer the animals from death. Thefore, the objective of this paper is to review the common types of canine urolithiasis and its prevention.

Keywords: Canine, Urolithiasis, Uroliths

Introduction

Uroliths are formed in all the species of domestic animals, and is one of the important lower urinary tract diseases in dogs (Markwell P.J, 2000).Formation of uroliths is not a disease but rather a complication of severaldisorders, which is pretty often a result of a combination of both pathological and physiological factors. Some disorders can be identified and corrected but some can be identified but not corrected, although for others, the underlying etiopathogenesis is not known (Lekcharoensuk C, et al, 2002).

Urolithiasisa is the medical term for the presence of stones (known as "uroliths") in the urinary tract(www.familyvet.com). The term urolith is derived from the Greek ouron meaning urine, and lithos meaning stone (Osborne et al., 1999). The formation of uroliths specifically in cats and dogs is not a new phenomenon. Ashmont (1891) said of bladder uroliths in a review on urolithiasis in dogs and cats BJVM, 18, No12dogs, "a cure was out of the question". Kirk (1925) described "retention of the urine" as a very common condition in cats, and Blount (1931) also noted that seven different types of uroliths occur in cats, and that magnesium ammonium phosphate was present in the majority of such deposits in alkali urine.

Canine urolithias is not a single disease, but is often secondary to one or more conditions. Clinical signs of urolithiasis also may be the first indication of underlying systemic disease. When uroliths are diagnosed, the history and physical exam should focus on finding and eliminating any underlying condition that may predispose the dog to urolith formation (Remillard RL., et al, 2000). Urolithiasis can be defined as the formation of sediment anywhere with in the urinary tract which consists of one or more poorly soluble urine crystalloids. An uroliths may be defined as the aggregation of crystalline and matrix materials that form in one or more locations within the urinary tract when urine becomes over saturated with crystallogenic substances, and may be composed of oneor more mineral types (Ulrich et al., 1996).

Objective

The objective of this overview is to understand what is canine uroliths deeply and also what causes are result for this formation that is important for the diagnosis, treatment, and prevention of the problem. It also to give the clues how to differentiate calculi formation from other problem depending on some clinical signs in case of clinical sign is observable. Finally to recommend the pet animal owners about this case to carry out their responsibility to improve its prevention.

Literature Review

Aetiology

Urolith is formed in all the species of domestic animals, and is one of the important lower urinary tract diseases in dogs. Formation of uroliths is not a disease butrather a complication of several disorders, which ispretty often a result of a combination of both pathological and physiological factors(Watson J.M, 2010). Some disorders can be identified and corrected but some canbe identified but not corrected, although for others, the underlying etiopathogenesis is not known(RobertsonW.G, 200). Some risk factors that are known to affect canine uroliths include breed, gender, age, anatomical and metabolic abnormalities, urinary tract infections, diet, and urine pH (2-5) (Bartges, J. W., 1999). Silica-containing uroliths were first reported in the United States in1976 asassociated with an increased use of plant-derived ingre-dients by the pet food industry and anincreased availability of crystallographic techniques for urolithanalysis. Silica containing uroliths frequently, but not always, have a jack shape, although not all jack-shaped stones are silicates(ammoniumurate,calcium oxalate, and struviteuroliths may also be jack-shaped). Silica-containing uroliths occur infrequently in dogs.

Inci-dence ranged from 0.4% –9.6%1-6in several large retrospective studies at urolith anal-ysis laboratories. Many of the reported silica-containing uroliths in the United States have occurred in German shepherd dogs, shih tzus, old English sheepdogs, and golden and Labrador retrievers. Most silica-containing uroliths are diagnosed in dogs 6–8 years of age, and males are affected more commonly than females (>9:1 M:F).In most dogs, numerous silica uroliths form, versusa solitary urolith. Silica-containing uroliths are radiographically opaque compared with surrounding soft tissue(www.cliniciansbrief.com)

Kinds of Canine Urolithiasis

Urolithiasis can be classified into different depending on their aetiology or cause, they are like struvite, oxalate, cysteine and urateurolithiasis. The causative agent like calcium oxalate, cysteine (amino acid), and others are described at figure 1.

Struvite Urolithiasis

Struviteurolithiasis in dogs is commonly induced by urinary tract infection with urease-producing bacteria; how ever, other conditions that promote crystallization of magnesium ammonium phosphate, such as alkalineurine, diet,and genetic predisposition, may also be associated with struvitecalculogenesis (Osborne CA,et al 1995).

Struvite crystals are found in urinaly-ses from normal dogs because dogs excrete magnesium, ammonium, and phosphate. The most common etiology of urolith formation is urinary tract infection with bacteria that produce urease (staphylococci, Proteusspp) causing urinealkalinization. Female dogs have a higher incidence than males. Struviteuroliths can affect any age animal. Sterilestruviteuroliths occur occasionally. The stone should be cul-tured when urine is sterile(www.ivis.org.com).

Calcium Oxalate Urolithiasis

Hypercalciuria is thought to be the important factor in formation. Most affected dogs are nor-mocalcemic. However, hypercalciuria may be secondary tohypercalcemia. Calcium oxalate uroliths cannot be dissolved. Calcium oxalate cystoliths may be able to be removed by urohydropulsion or cystoscopy (www.ivis.org.com).

Cysteine Urolithiasis

cystine is a non essential sulfur-containing amino acid made up of 2 cysteine molecules joined by a disulfide bond. It is found in most high-protein foods, including pork, poultry, eggs, and dairy products, as well as oats and wheat germ. Cystine is absorbed by the small intestine, freely filtered by the glomerulus, and then reabsorbed by an active process in the proximal convoluted tubule. Decreased tubular reabsorption of cystine results in cystinuria. Cystinuria (>75–125 mg cystine/g creatinine) is a predisposing and required factor for cytine urolithiasis, but not the sole cause of cystineurolith formation; not all dogs with cystinuria form cystine uroliths or even have cystine crystals in their urine; the exact mechanism of cystine uro-lith formation is unknown. Cystine is most soluble in alkaline solutions, hence cystine uroliths usually form in acidic urine. Cystinuria can be detected with a cyanide–nitroprusside test, but ampicillin and sulfur-containing drugs in the urine may cause false-positive results (www.cliniciansbrief.com).

Urate Urolithiasis

Urateuroliths belong to the purine family of uroliths and are the third most common urolith type in dogs and cats. In dalmatians, an autosomal recessive trait is responsible for hyperuricosuriaand a predisposition to urateurolithiasis. In other dog breedsand in cats, urateuroliths are predominantly associated with liver disease, specifically porto systemic vascular anomalies. Idiopathic urateuroliths may occur in animals without liver disease. Ammonium urateuroliths are most common. Urateuroliths are amenableto medical dissolution. Ingested protein and endogenous protein turnover are sources of purines, which are metabolized to hypoxanthine. Through the action of xanthine oxidase, hypoxanthine is converted to xanthineand uric acid (StevensonAe, et al 2003).

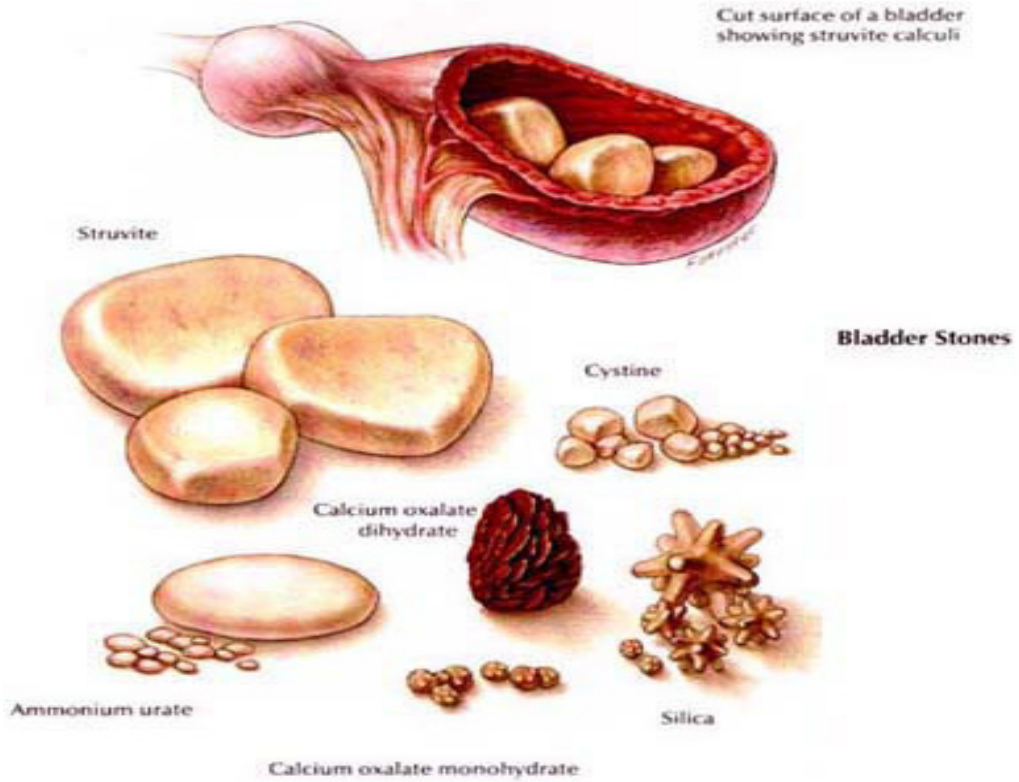

Fig1. *The kind of uroliths and urolithiasis in canine (source:https://castle-vets.co.uk/berties-story-canine-urolithiasis)*

Clinical Signs

Some affected dogs have no signs of disease (asymptomatic). Signs depend on location, size, and number of stones (uroliths). Typical signs of stones in the urethra (the tube from the bladder to the outside, through which urine flows out of the body; stones known as (urethroliths) include abnormal frequent passage of urine (pollakiuria); difficulty urinating (dysuria), and sometimes small, smooth stones (uroliths) are passed when the pet urinates (voids).Struvite stones of the kidney (nephroliths) may be associated with signs of kidney insufficiency or failure such as; increased urination (polyuria) and increased thirst (polydipsia).

Obstruction to urine outflow with bacterial urinary tract infection may result in inflammation/infection of the kidney (pyelonephritis) and generalized disease caused by the spread of bacteria in the blood (septicemia) signs might include increased urination (polyuria), increased thirst (polydipsia),abdominal or lumbar pain, and fever. Struvite stones may be felt in the urinary bladder and/or urethra during physical examination. Blockage or obstruction of the urethra may cause enlargement of the urinary bladder (**Figure 2**). Obstruction of a ureter (the tube running from the kidney to the bladder) may cause enlargement of the associated kidney (www.familyvet.com).

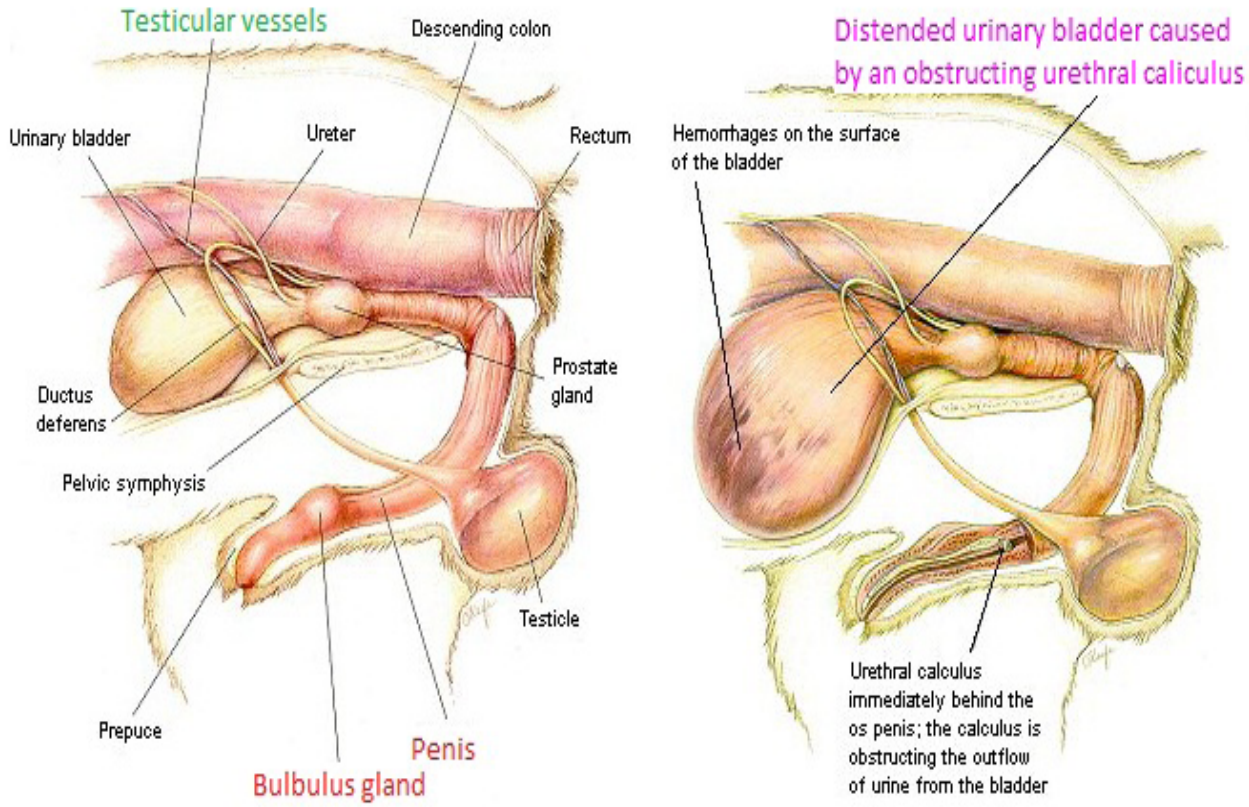

Fig2. *the clinical sign of urolithiasis in canine animals (source:https://castle-vets.co.uk/berties-story-canine-urolithiasis).*

Diagnosis

Uroliths are diagnosed by palpation or by radiography/ultrasonography. The type of urolith is determined by quanti-tative stone analysis. An educated guess as to the type of urolith can be made by considering signalment, history of pre-vious stone formation, urinalysis (especially urine pH), urine culture, serum calcium concentration, and radiodensity (www.cliniciansbrief.c).

Treatment

If calculi are confined to the bladder and are smaller thanthe diameter of the urethra, they can be removed by urohy-dropulsion. Medical treatment for the dissolution of Ca oxalateurolithiasis has not yet been developed. Surgical removal of urocystoliths remains the primary treatment modality, although less invasive urolith retrieval and/or destruction methods (eg, voiding uro-hydropropulsion, catheter retrieval, stone basket retrieval, litho-tripsy) are becoming more commonplace (www.cliniciansbrief.com).

Prevention

Diet is an important factor in the prevention of CaOx stones. Canned diets highin fat, phosphorus, magnesium, potassium, chloride, and moisture have been associated with decreased risk of CaOx formation(Adams LG,.2004). Reducing dietary carbohydrate has reduced the risk of CaOx urolithiasis in dogs but not in cats(Lekcharoensuk C,.2002). Dry diets with a high fiber content have been shown to be associated with an increased risk of urolithiasis in dogs.

Conclusion and Recommendations

Urolithiasisa is the medical term for the presence of stones in the urinary tract. This case specifically not asingle diseases; it's the result or secondary to single or more conditions. Gender is one risk factor that faccilitate the formation of urolithis in urinary tract of pet animals, this is why that urolithiasis is more common in male than female pet animals.

Unusual case of foreign body-induced struviteurolithiasis, Calcium oxalate urolithiasis, Cysteine urolithiasis and UrateUrolithiasis are some kinds of urolithiasis. Struviteurolithiasis in dogs is commonly induced by urinary tract infection with urease-producing bacteria. Hypercalciuria is thought to be the important factor in formation. cystine is a nonessential sulfur-containing amino acid made up of 2 cysteine molecules joined by a disulfide bond. It is found in most high-protein foods, including pork, poultry, eggs, and dairy products, as well as oats and wheat germ. Urateuroliths belong to the purine family of uroliths and are the third most common urolith type in dogs and cats. In other dog breeds and in cats, urateuroliths are predominantly associated with liver disease, specifically portosystemic vascular anomalies.

Unlike many other diseases in most cases of urolithiasis in pet animal is asymptomatic, that result in difficult to recognize the problem recently. Signs depend on location, size, and number of stones. The wrong related with abnormal frequent passage of urine (known as "pollakiuria") and difficulty in urinating is some time recognized as typical clinical sign of urolithiasis. Obstruction to urine out flow with bacterial urinary tract infection may result in inflammation/infection of the kidney.

Most of the time this case need experienced technician to diagnose properly what problem is happened to the animals. Uroliths are diagnosed by palpation or by radiography/ultrasonography. Generally during the urolithiasis is suspected to the pet animals carrying out the important diagnose tools and treatment methods inorder to save the life of those pet animals as much as possible.

Depending on the above conclusion, the following recommendation will be forwarded:

Taking the responsibility to the pet animals to improve their health problem is carrying out by the owners of the animals that followed by the doctors of veterinary medicine. This means most of the time it's simple for the owners to follow his animals, and then taking the animal to the area of veterinary clinic available or calling for veterinarians. So, the veterinarians have to give full of advises to the farmers or any of anima owners concerning the urolithiasis that include the diet that can result in this problem and how to feeding those animals. Accepting guidelines from veterinarians and applying important things on his animals to prevent this disorder is the

core responsibility of the owners of the animals. Finally the owners have to carry out the important things to the animals and even if the problem is appeared to the animals he have to try to save his animals as much as possible as soon as.

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