

The Diagnosis Of Bladder Calculus with emphasis on

Ultrasonography in a dog: A Case Report

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SUMMARY

A 10kg, 5 year old dachshund bitch (case no 36181) was presented to the University of Nairobi Small Animal Clinic (UON, SAC) with a history of hematuria. The patient was mildly dehydrated and dull. Palpation of the ventral abdomen elicited discomfort. Observation at micturition revealed that blood was voided at the end of micturition. Hematological examination showed presence of cytoplasmic morulae of *Ehrlichia Phagocytophilum*. Lateral and ventro-dorsal radiographic views revealed presence of a bladder calculus. Ultrasound examination showed presence of a hyper-echoic mass which cast a clear acoustic shadow distal to it located in the bladder. The calculus measured about 2.5cm horizontal diameter and 1cm vertical diameter. The urine appeared anechoic with no debris and the bladder wall measured 0.2mm thickness. The calculus was removed by a cystotomy procedure.

INTRODUCTION

Ultrasound is an easy to perform and non invasive imaging modality in diagnosing various diseases (WHO, 1998). The machine utilizes high frequency sound waves to create an image. It does so via a transducer (probe) which produces the sound and receives reflected waves. The probe is lined with piezoelectric (Quartz) crystals which, when charged by a voltage, vibrate causing ultrasound waves (pulse) to be produced at a set frequency. Once the sound waves hit a tissue interface of different densities, some sound waves are reflected back (echo) and are detected by the piezoelectric crystals. These produce a corresponding current which is converted

to a two dimensional digital image on the machine monitor which depicts the tissue appearance (Lamb, 1995; Barr, 1988)

The tissue appears as dark (anechoic), gray (hypoechoic) or white (hyperechoic). In this way different organs can be distinguished based on their density and velocity of the sound in the tissue (i.e. acoustic impedance of the tissue). This forms the basis of identification of the organs (Burk and Feeney, 2003). The size of organs can also be determined by calipers in the machine software which allow for a two dimensional measurement of the organ (Lamb, 1995).

Urocytolithiasis is defined as the macroscopic precipitation of crystals in urine. Ultrasonography is used to evaluate the nature of the bladder and its contents. The silhouette of the bladder is used in identifying bladder position and pathology (Hayward 2006). Calculi have mineral composition and thus facilitate visualization using ultrasound due to the formation of acoustic shadows distal to them.

Urolithiasis occurs in 0.4-2% of the canine population (Morgan V.R, 1997). Most calculi contain magnesium ammonium phosphate, while others contain calcium phosphate, cosine, oxalate, orate and silica. The incidence of urolithiasis is equal in both males and females. Formation of calculi occurs due to several factors: 1. the degree to which urine is supersaturated with relevant salts. This determines the rate to which crystals are formed their growth and aggregation in the system. 2. The rate at which crystalline particles are retained for long enough in the urinary tract due to adherence or sluggish / incomplete urine outflow. The formation of phosphate crystals is favored by alkaline urine which decreases their solubility. The other crystalline crystals are usually formed in acidic urine. The urine pH has no effect however on other metabolic calculi.

In bitches, over 80% of calculi formed are phosphate and vary in size. The calculi are mainly found in the urinary bladder. The cosine, oxalate, and orate calculi are specific to the male where they are found in the bladder, urethra at the os penis and ischial arch location. Calculi can occur at any age but mainly between the ages of 4-6. Breeds predisposed to calculi include; Corgi, Miniature schnauzer, Miniature poodle, Dachshund, Shi-Tzu, Lhasa Apso, Dalmatian, Cocker Spaniel and Yorkshire terrier (Gisselman et al, 2009), (Escolar et al, 1991).

Treatment of calculi may be either medical or surgical management. Medical management involves the dissolution of the crystals by affecting the mechanisms mentioned above. Surgical management involves removal of the calculi by cystotomy or urethrostomy procedures. A thorough physical and anesthetic risk evaluation should be a prerequisite to the surgery due to the compromised electrolyte imbalance.

Figure 1: Sonogram showing a hyperechoic ovoid mass at the distal border of the urinary bladder with an acoustic shadow distal to it

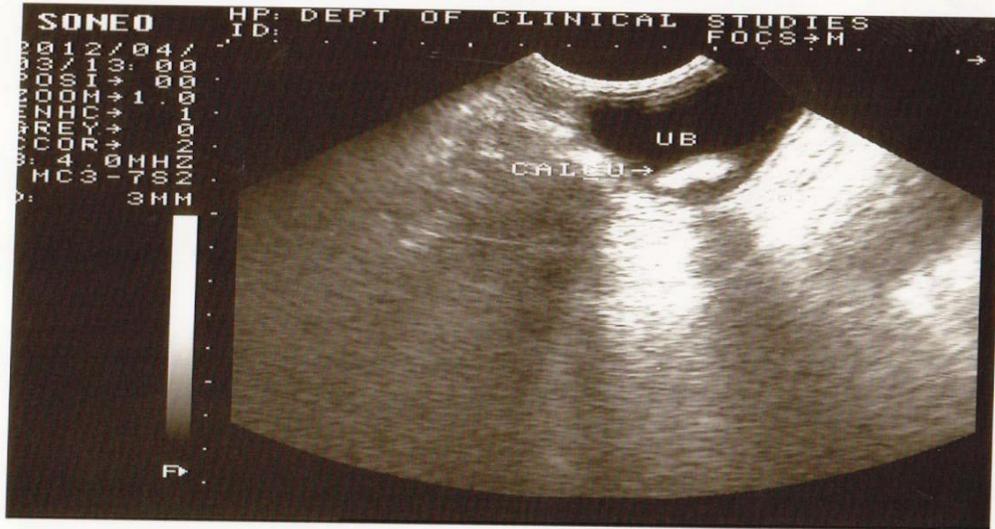


Figure 2. Radiograph showing increased opacity of a rounded mass cranial to the right of the pelvic bones indicative of a calculus



Shadow of
calculi in the
bladder

Table 1: Urinalysis results

| PARAMETER | RESULT | NORMAL | PARAMETER | RESULT | NORMAL |
|------------------|---------------|---------------|------------------|---------------|---------------|
| Colour | Amber | Brown | Sediment | Nil | Nil |
| Appearance | Turbid | Clear | Epith Cells | ++ | Nil |
| Specific Gravity | 1.025 | 1.016-1.060 | Erythrocytes | +++ | Nil |
| pH | 6 | 7.0-7.5 | Leukocytes | +++ | Nil |
| Protein | + | Nil | Casts | Nil | Nil |
| Glucose | Nil | Nil | Granular | Nil | Nil |
| Acetone | * | | Bacteria | Nil | Nil |
| Blood | ++ | Nil | Crystals | Nil | Nil |
| Bilirubin | Nil | Nil | Sperm | Nil | |
| Urobilinogen | Nil | Nil | | | |
| Creatinine | * | | | | |

+low levels, ++ moderate levels, +++ high levels, * tests not done due to lack of re-agents

CASE HISTORY AND MANAGEMENT

A 10kg, 5 year old dachshund bitch (case no: 36181) was presented to the University of Nairobi, Small Animal Clinic (UON SAC) with a history of hematuria. Further examination showed it to be mildly dehydrated and dull. Observation of micturition revealed straining with blood voided at the end of the process. Radiologic examination showed presence of a radio-opaque ovoid mass in the urinary bladder which was ruled as a cystourolith (Fig. 1). Ultrasonography showed the presence of an ovoid hyper-echoic mass which cast a clear acoustic shadow (Fig. 2). The hyper-echogenicity of the mass suggested a mineral composition which is consistent with a bladder calculus. The internal calipers of the scanner facilitated the measurement of the mass which was 2.5cm in horizontal diameter and 1cm in vertical diameter. The bladder wall was also measured and shown to be 0.2cm thick. The urine had a clear anechoic appearance with no debris. Urinalysis of the urine sample collected via cystocentesis revealed presence of leukocytes, erythrocytes, protein, blood and epithelial cells (Table. 1). The most effective management of the cystourolith was cystotomy to remove the calculus. The patient was stabilized by infusion of Lactated Ringers solution (500ml) to correct the anticipated electrolyte imbalance. Sedation was done using Xylazine Hydrochloride 2% (Bomazine ®) at a dose rate of 1.0mg/kg body weight (0.3ml IM). 2.5% thiopental sodium was infused intravenously 10 minutes following premedication at a dose rate of 10mg per kilogram body weight given to effect (3ml).

With the ventral abdomen shaved and prepared for surgery a ventral midline incision was made 5cm caudal to the umbilicus and extended caudally. The bladder was located and exteriorized and sterile swabs packed around to create a seal around it. The avascular margin of the bladder

was located and a stab incision made. A suction pump was inserted through the slit and the urine drained. The incision was extended using Mayo scissors to facilitate exploration and examination of the bladder. The calculi was located and removed. The incision was closed using a Cushing pattern and over sown with lembert using chromic catgut 2/0. The omentum was sutured to the incision margins to seal the bladder using polydioxanone (vicryl) 4/0. The skin and muscle were sutured routinely. Post operative management included amoxicillin 300mg given intramuscularly (IM) and dexamethasone 4mg given IM. An Elizabethan collar was applied to prevent the dog from interfering with the sutures. Sutures were removed 10days later and patient discharged.

DISCUSSION

This case report describes a 5 year old dachshund bitch with hematuria due to the presence of a urolith in the urinary bladder. The diagnosis of urolithiasis in this dachshund bitch was dependent on various factors which included; clinical signs such as hematuria and stranguria, signalment, radiologic and ultrasonographic findings. Other signs often reported include lumbar or abdominal discomfort, depression, anorexia, vomiting, dysuria or stranguria, pollakiuria and cloudy urine.

The signalment of the patient is also crucial in the diagnosis of urolithiasis. Breeds predisposed to urolithiasis include: Dachshund, Miniature Schnauzer, Bichon Frise, Cocker Spaniel, Miniature Poodle, Yorkshire Terrier, Lhasa Apso, Cairn Terrier, Shih Tzu, Dalmatian, English Bulldog, German Shepherd, Golden Retriever, Labrador Retriever, Old English Sheepdog, Bassett Hound, Irish Terrier, Rottweiler, Chihuahua, Tibetan Spaniel, Mastiff and Newfoundland. Dachshund breeds have an increased calcium oxalate incidence with an odds ratio of 2.69 (Gisselman et al, 2009), (Escolar et al, 1991).

Confirmatory diagnosis of urolithiasis is done by use of imaging techniques using Radiography and Ultrasonography. Survey radiographs show the presence of a radio-opaque mass located in the bladder (for cases of cystouroliths), while ultrasound scans will show hyperechoic masses in the bladder surrounded by anechoic urine. However some uroliths appear as radioluscent masses and are therefore only visualized by used of ultrasonography of contrast radiography. Ultrasound offers a better imaging modality due to the visualization of urinary crystals which cannot be detected on radiologic examination. The radiographs and the scans of the patient showed a typical picture of cystourolithiasis.

The choice of surgical management of the patient was arrived at based on the size of the calculus and the good anesthetic score of the patient. Cystotomy to remove the calculus is recommended for large calculus in females which cannot be dissolved by medical management. The prognosis of such patients is favorable though recurrence may occur should preventive measures to calculus formation not be implemented. These include; dietary substitutes, reducing table salt content in kitchen prepared foods and increased water intake.

CONCLUSION

Ultrasonography is a safe and noninvasive diagnostic imaging technique which allows visualization of bladder calculi and bladder crystals. Routine examination of the urinary bladder in breeds predisposed to bladder calculi formation allows detection of early crystal formation prior to their aggregation to form calculi and thus allow for early medical management of the condition.

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