The Use of Contrast Radiography in the Diagnosis of Bladder Calculi and Bladder Rupture: A Case Report.

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ABSTRACT:

A 5 year old entire male cocker spaniel dog (CASE NO 36034) was referred to the University of Nairobi Small animal clinic with a history of stranguria, abdominal enlargement, ocular discharges and urinary incontinence. The dog had been previously treated with furosemide showing no recovery. The dog appeared dull and the hair at the ventral abdomen and hind limbs was wet with urine. On physical examination the abdomen was tense and the patient showed discomfort. The mucus membranes were pale and an open abscess was found on the lateral wall of the thoracic cavity. Lateral and dorso-ventral plain radiographic views of the abdomen showed 4 radioopaque rounded masses, thought to be bladder calculi, located in the bladder and 6 urethral calculi. Negative contrast radiography further showed the enlargement of the prostate gland. Ultrasonography of the bladder showed the masses to be hyerechoic zones with clear acoustic shadows ventral to the hyperechoic zones Urinalysis showed the presence of calcium phosphate crystals with bacteria present. Biochemistry revealed elevated urea nitrogen levels of an elevated alkaline phosphatase levels . The patient was referred for surgical removal of the calculi via cystoyomy. Following cystotomy the patient did not void any urine and became uremic 48hours following surgery and abdomen was distended. Positive contrast radiography reveals a ruptured bladder. A decision to euthanize the patient was arrived at due to the poor prognosis of the patient surviving a second surgical procedure.

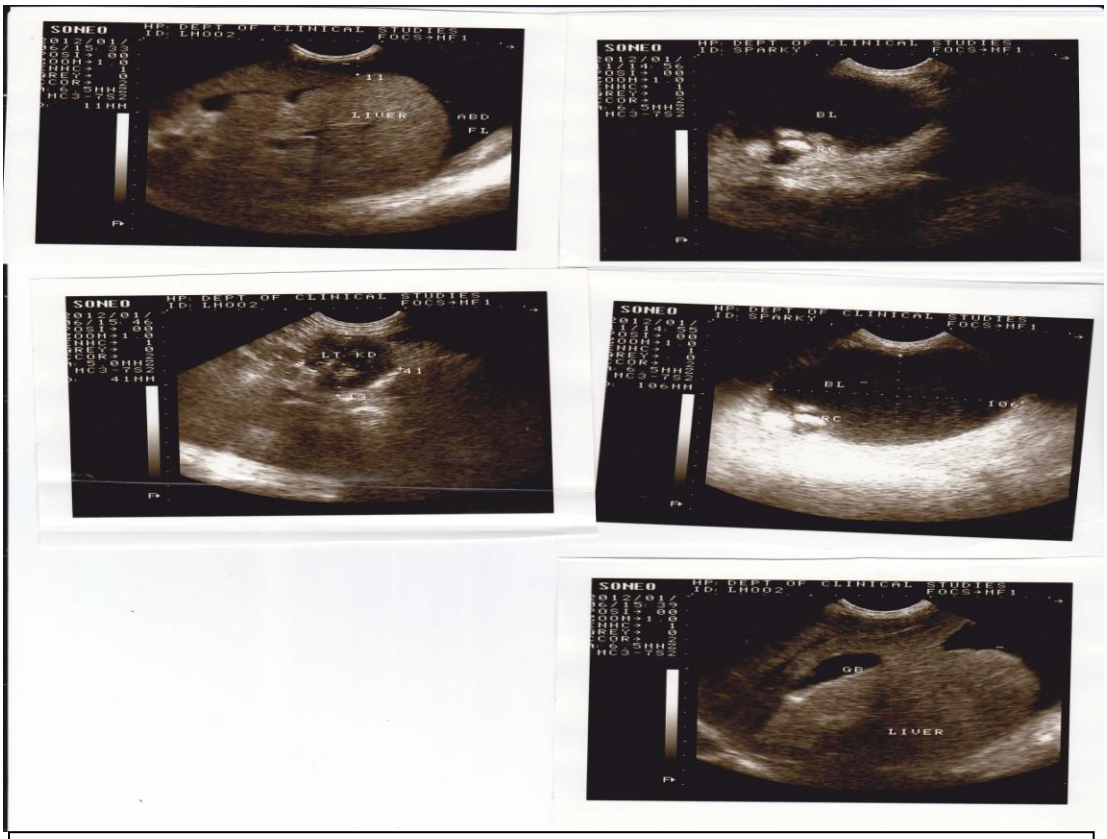

Fig 1: a pre operative ultrasound showing calculi in the bladder and abdominal fluid in the abdomen

Table 1: Hematological results

Hematology parameter	Result	normal
PCV %/100	55.2	
Hemoglobin mmol/L	13.0	
RBC $\times 10^{12}$/L	7.44	
Platelets $\times 10^{9}$/L	252	

M.C.V fl	74.3	
M.C.H.C mmol/dl	23.5	
W.B.C /10^9/L	21,390	
Neutrophils	83	
Mature	83	
Immature	0	
Lymphocytes	17	

Table 2: Results of urinalysis from voluntarily voided urine

Parameter	result	Normal	Parameter	result	Normal
Color	amber	Amber to brown	Sediment	*	Nil
Appearance	clear	Clear	Epith cells	1-2 HPF	Nil
Specific gravity	1.020	1.016-1.060	Leukocytes	nil	Nil
pH	7.0	7.0-7.05	Casts	Nil	Nil
Protein	nil	Nil	Granular	nil	Nil
Glucose	nil	Nil	Bacteria	present	Nil

Acetone	*		Crystals	Calcium phosphate	Nil
Blood	+++	Nil	Sperm	nil	Nil
Bilirubin	nil	Nil			
Urobilinogen	nil	Nil			
Creatinine	*				

+ low levels, ++ moderate levels, +++ high levels

Table 3: Biochemistry test results

chemistry	result	Normal
Urea nitrogen mg/dl	256.8	
creatinine	5.0	
Alkaline phoshatase IU	246	
AST IU		

IU international units, AST aspartate transferase

INTRODUCTION

Diagnostic imaging is a vital component of evidence based medicine. It allows the visualization of internal structure of abdominal organs and interpretation of disease. Imaging also allows for non invasive techniques to confirm diagnosis (Defarges, 2007). The diagnostic imaging

techniques available for small animal practice include; radiography, ultrasonography, endoscopy, computed tomography, magnetic resonance imaging and scintigraphy (Igna, 2008). The extent of their use is limited by availability, cost and expertise. Despite global trends in diagnostic imaging, radiography remains the most commonly used technique in developing countries including Kenya. The use of radiography as the sole imaging technique has limitations in differentiation of soft tissue masses and is also not sufficient in identifying masses surrounded by fluid. Contrast radiography facilitates the visualization of draining patterns as it highlights the draining pathways of fluids such as urine and blood and delineates viscous organs such as esophagus, stomach, intestines and bladder (Bradley 2005). The use of positive contrast, negative contrast and a combination of both are used to confirm diagnosis. Contrast radiography and ultrasound are useful in identifying bladder position and pathology (Hayward 2006).

CASE HISTORY AND MANAGEMENT

A 5 year old entire male cocker spaniel dog (CASE NO 36034) was referred to the University of Nairobi Small animal clinic with a history of stranguria, abdominal enlargement, ocular discharges and urinary incontinence. The dog had been previously treated with furosemide with no recovery. The dog appeared dull and the hair at the ventral abdomen and hind limbs was wet with urine. On physical examination the abdomen was tense and the patient showed discomfort. The mucus membranes were pale and an open abscess was found on the lateral wall of the thoracic cavity. The area around the abscess was shaved, and the abscess cleaned and drained with the dog under light sedation of 2% xylazine HCl 1mg (0.5 ml) via a sub cutaneous injection. With the dog still under sedation , the bladder was catheterized and urine voided. Antibiotics

were administered (amoxicillin trihydrate - Betamox® 150mg (2ml) given intramuscularly. Lateral and dorso-ventral plain radiographic views of the abdomen showed 4 radioopaque rounded masses, thought to be bladder calculi, located in the bladder and 6 urethral calculi located at the ischial arch. Negative contrast radiograph was required to delineate the exact location of the calculi. A male urinary catheter was introduced and the urine in the bladder drained. Ultrasonography of the bladder showed the masses to be hyperechoic zones with clear acoustic shadows distal to the hyperechoic zones. Urethral calculi could not be visualized due to the proximity of the urethra to bone thus impairing visualization.

Air was then pumped into the bladder and radiographs taken. The lateral view of the pneumocystograph showed that several calculi were located in the urethral lumen and that the prostate gland was dilated by the air indicating that there was a pocket draining from the gland. The patient was scheduled for surgery to remove the calculi.

The patient was prepared for surgery by shaving of the ventral abdominal area. Lactated ringer solution was administered intravenously to correct fluid imbalance. Sedation was done using 2% xylazine hydrochloride (at a dose rate of 1.3 mg per kilogram body weight) 2.4mg (1.2ml) was given via an intramuscular injection. The patients' ventral abdomen was shaved and a urinary catheter secured in place to drain the urine. Induction of anesthesia was achieved 10 minutes after the Xylazine injection by use of 2.5% thiopental sodium (at a dose rate of 10 mg per kilogram body weight) 5mg given via intravenous route to effect. Anesthesia was maintained using halothane gas via an endotracheal tube. A ventral midline incision was made caudal to the umbilicus and extended caudally towards the pelvis with scissors. The penile shaft was laterally displaced to facilitate extension of the incision. The bladder was located and exteriorized. Stay

sutures were used to secure the bladder wall using 2/0 chromic catgut. Moistened sterile swabs were packed around the bladder to seal the edges and avoid spillage. A stab incision was made n the least vascular margin of the bladder and urine drained by use of a suction pump. The bladder was explored and 4 calculi in the bladder removed. Retrograde flushing of the urethral calculi was achieved through the urinary catheter and saline solution. The 10 urethral calculi were dislodged and flushed into the bladder where they were removed manually.

The bladder wall became edematous during the procedure which later compromised wound closure. The incision was closed by use of 2/0 chromic catgut in a near-near-far-far pattern to relieve the tension at the margins. Wound closure was affected by the extensive edema of the tissues. A second simple interrupted suture pattern was added to create a seal. The omentum was anchored to the sutured margin to seal the bladder wall. The wall was examined for leakage. The laparatomy incision was closed routinely. Postoperative management included an Elizabethan collar, caprofen 32.5 mg orally once a day and amoxicillin trihydrate 300mg via intramuscular injection. 2 days Post-operatively the dog began to vomit and the abdomen was distended. Positive contrast radiography reveals a leakage of the bladder on the vetro-cranial border. Examination of the gums reveals presence of ulcers. The dog was ruled to be uremic and thus a poor anesthetic risk for a follow-up corrective procedure. The dog was euthanized due to the severity of the condition. Post mortem examination revealed the presence of a calculi lodged in the urethra and a tear in the bladder wall.

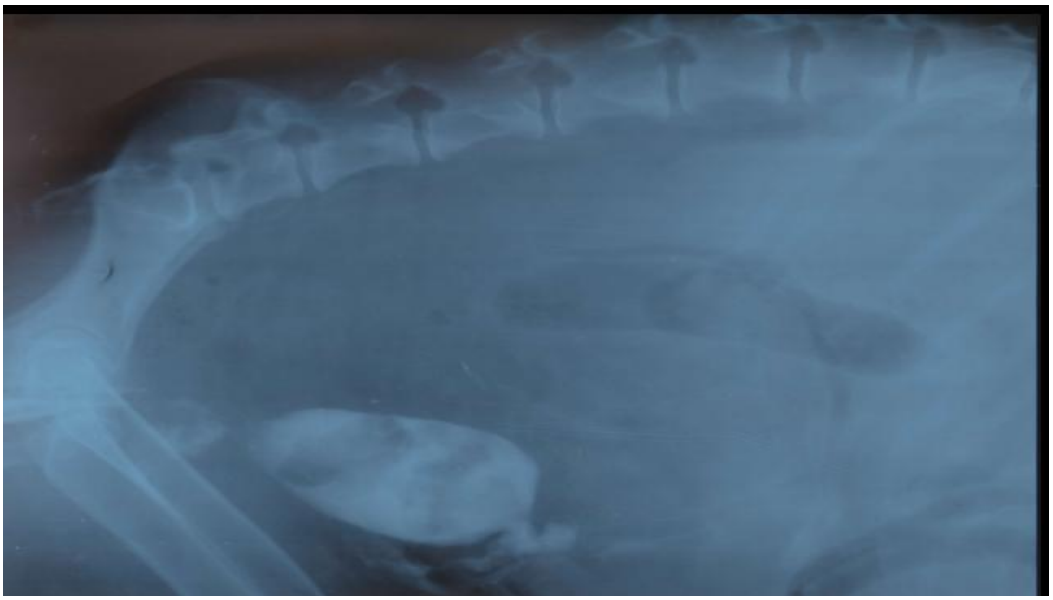

Fig 2. Iodinated contrast agent shows leakage of the bladder n the ventro-cranial border of the bladder. Accumulation of the iodinated compound is also seen in the prostate gland which has been dilated by the compound.

Fig 3. The calculus recovered from the urethra at the post mortem examination

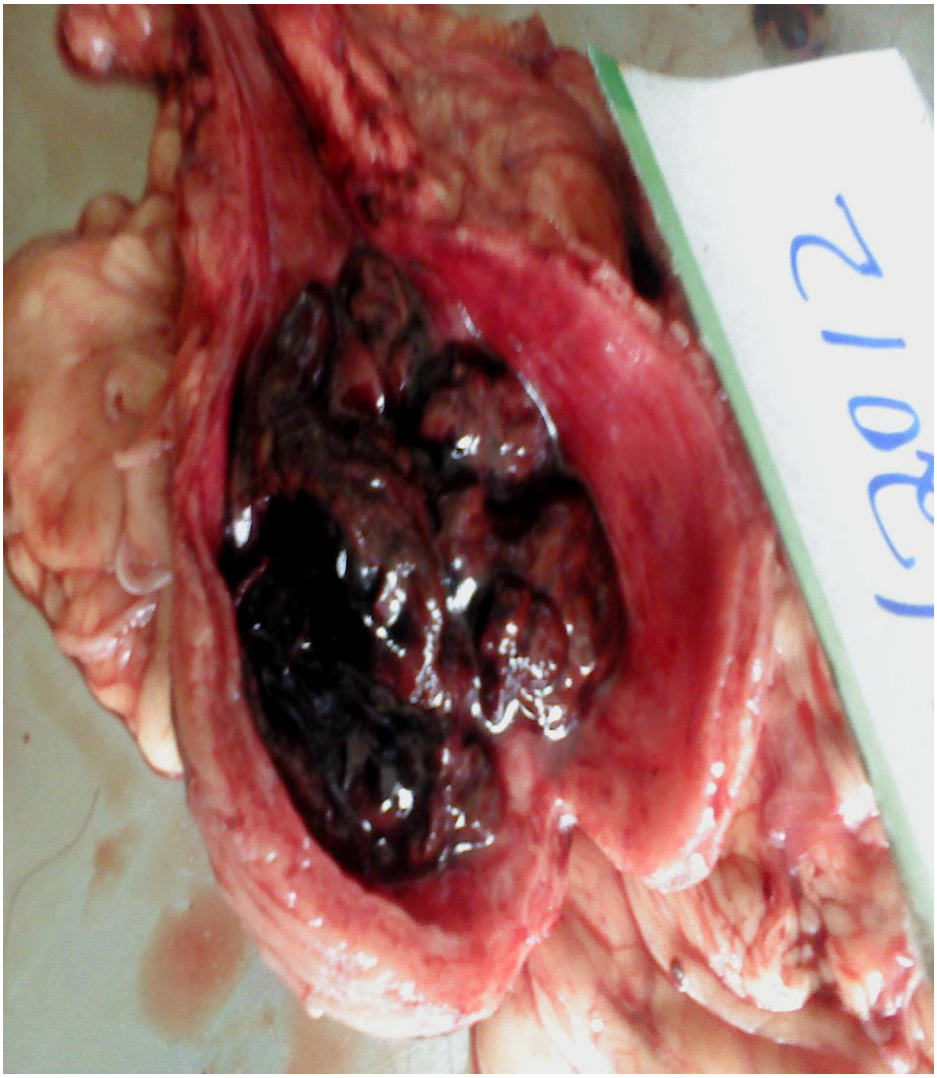

Fig 4: post mortem picture of the bladder showing a clot where the incision site ruptured and caused hemorrhage

DISCUSSION

Contrast radiography is used in veterinary medicine in the evaluation of draining patterns, obstructions and leakages. There are two types of contrast radiography techniques; positive and negative contrasts. Positive contrast utilizes the principle that certain compounds have increased opacity. The common agents used are barium salts and iodinated compounds. Barium is used in examination of the gastrointestinal system and is administered orally due to its viscosity. It is used to evaluate the esophagus, stomach, duodenum, ileum, jejunum, colon and rectum Iodinated

compounds are used to evaluated blood flow and are administered by intravenous routes. Because iodinated compounds are excreted in the urine they can also be used to evaluate the drainage of urine from the kidneys. Iodinated compounds can also be administered retrograde into the bladder via urinary catheters. Iodinated compound are also used in the evaluation of the integrity of the spinal cord, to evaluate for herniations and trauma.

Negative contrast utilizes air which is radiolucent to visualize and evaluate blockages and obstructions or even create a contrast with the surrounding tissues. The gases used for negative contrast include; air, oxygen, nitrous oxide and carbon dioxide. Air is normally used due to its easy availability. Air is pumped into the bladder by use of a urinary catheter following the evacuation of the bladder.

The use of a combination of both techniques in the diagnosis of bladder conditions facilitates further evaluation of the integrity of the bladder wall for growths, foreign bodies and tumors.

CONCLUSION

The use of contrast radiography is of great benefit in the diagnosis of bladder calculi and bladder rupture. The relatively inexpensive and non invasive procedure is quick and allows for confirmed diagnosis and prompt management.

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