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Surgical management of cystic and urethral caliculi in a beagle dog

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Abstract
A 9.5 yr old male beagle dog was presented with history of vomition, oliguria, stranguria, pollikuria since one month. On general clinical examination dog was active and alert. Radiographic and ultrasonographic examination diagnosed Cystic and Urethral caliculi. Under general anaesthesia cystotomy and prescrotal urethrotomy was done. The animal recovered uneventful.

Keywords: caliculi, cystotomy, urethrotomy

Introduction
Urolithiasis poses an acute life threatening emergency and most frequently obstructs the lower urinary tract in male dogs (Franti *et al.*, 1999) [4]. Urolithiasis has an increasing concern in small animal practice due to multifactor involvement. In brief, any factor that disrupt equilibrium between the promoters and inhibitors of urinary crystallization results in calculi formation (Basavaraj *et al.*, 2007) [2]. Calculi are composed of minerals as well as organic matrix. The different types of minerals detected in urinary calculi include struvite, calcium oxalate, silicate, urate and cysteine, etc. Struvites and calcium oxalate stones are most commonly encountered in canines (Low *et al.*, 2010) [6]. The most probable causes include infections, nutritional deficiencies and mineral imbalances. The mineral deposits which form in the bladder of male dogs get flushed out of the bladder with urine and lodge in the penis just behind the os penis which is the most commonly reported site of obstruction followed by ischial arch (Franti *et al.*, 1999) [4]. The calculi can get lodged anywhere in the urinary tract from kidney to urethral orifice (Makhdoomi and Gazi, 2013) [7]. In canine, the predilection site is behind the os penis. The clinical symptoms and signs associated with urolithiasis depend on the nature as well as location of uroliths. When calculi is lodged in the bladder or urethra, the signs resemble that of lower urinary tract infection whereas those calculi located at renal pelvis or ureter results in acute or chronic kidney injury (Yann, 2019) [11]. The clinical manifestations include anuria, dysuria, hematuria, pollakiuria, which arises mainly due to the obstruction in urinary outflow. Obstruction can be either complete or partial. The obstructive urinary calculi cause trauma to the urinary tract and blocks the passage of urine leading to urinary retention.

A 9.5 year old male beagle dog was presented with history of vomition, hematuria, oliguria, stranguria and pollikuria since one month. On general clinical examination dog was active and alert. The vital parameters were found to be normal. Abdominal palpation revealed distended urinary bladder. Lateral pelvic radiograph revealed presence of multiple radioopaque urinary calculi within the bladder and at the mid ospenis region (Fig. 1). On ultrasonographic examination of urinary bladder multiple hyperechoic cystic caliculi with acoustic shadowing was noticed (Fig. 2). Physiological parameters viz., rectal temperature, heart rate, respiratory rate were within the normal clinical range. The blood picture showed mild leukocytosis. The DLC revealed neutrophilia (94% neutrophils, 6% lymphocytes). Serum biochemistry revealed elevated total proteins (7.8 g/dl). Urinalysis revealed Proteinuria and slightly acidic nature of pH 6 . Urine centrifugal sedimentation examination did not reveal any crystal morphology under microscope. Urine culture revealed mixed bacterial infection with organisms sensitive to Gentamycin, Chloramphenicol, Azithromycin, Amoxicillin, Ceftriaxone and Ciprofloxacin whereas resistance was noticed towards Tetracycline, Ampicillin+ Sulbactam, Nitrofurantoin.

The animal was fasted overnight and anaesthesia was achieved by premedicating with inj. Diazepam 0.2 mg/kg b wt iv, induction with inj. propofol 2-4mg/kg iv and maintainance with isoflurane inhalation. Retrograde hydropropulsion was attempted prior to the cystotomy. Urethral catherisation was made through advancing an infant feeding tube of 6fr size from tip of the penis to the caliculi site at mid os penis region. Every attempt was made to increase hydrostatic pressure by infusing 45 cc of sterile saline and 15 cc of lignocaine Jelly in a 60 cc syringe so as to facilitate the movement of the urolith in mid os penis region. This helped in retropulsing the caliculi from mid os penis to the caudal part of ospenis. As the caliculi did not pass in to urinary bladder prescrotal urethrotomy was done. Patient was positioned in dorsal recumbency and an 2-3 cm skin incision was made pre scrotally directly over the calculi. Subcutaneous tissue was dissected and the retractor penis muscle was moved laterally. An incision was made directly over the calculi on midline of urethra to decrease cavernous sinus bleeding. Hemorrhage was controlled with digital pressure and suction until suturing. The calculi was grasped with forceps and removed from the urethra. The urethral incision was closed in layers; urethral mucosa and tunica albuginea with 4-0 polyglactin 910 absorbable suture in a simple interrupted pattern, subcutaneous tissues with 3-0 polyglactin 910 absorbable suture in a simple continuous pattern and skin with 3-0 polyamide nonabsorbable suture. After successful retropulsion of urethral calculi into the bladder a parapreputial incision was made from umbilicus to pubis. The prepuce was retracted and a midline celiotomy was performed. The bladder with engorged blood vessels was exteriorized (Fig. 3) and stay sutures were placed . The ventral cystotomy incision was made from apex to neck .Stay sutures were placed on each side of the incision at its midpoint and all the caliculi were removed (Fig. 4) and indwelling urethral catheter placed was removed. After several lavages and negative results in obtaining stones, the catheter is placed from the bladder to pelvic urethra. The bladder wall was closed with 3-0 polyglactin 910 suture material in a simple continuous appositional suture pattern and a routine abdominal and skin closure was done.

Postoperative Care and Assessment

Postoperatively, daily antiseptic dressing along with combined antibiotic therapy of inj. Enrofloxacin @ 2.5mg/kg b wt S/C and inj. Amoxicillin @ 15 mg/kg b wt I/V , analgesics of inj. Melonex @ 0.2 mg/kg b wt I/V , inj. RL @ 150ml I/V, inj. DNS @ 200 ml I/V, inj. Pan @ 1mg/kg bwt IV was given for 5 days. Bleeding from urethrotomy site was noticed while urination for 5 postoperative days. Urinary catheter was removed two days after the surgery. Post operative radiograph showed no evidence of caliculi (Fig. 5). Serum biochemical and blood picture were within normal range. Skin sutures were removed on 10th day of post surgery. Dog recovered uneventfully within 2 weeks. Based on stone analysis caliculi was diagnosed as calcium oxalate uroliths. Dog was advised to feed on moisture rich foods i.e., canned diets with high moisture content.

Discussion

The formation of uroliths involves multiple physiological and pathological processes (Osborne *et al.,* 1996).Upper urinary tract stones are uncommonly reported in cats and dogs and the vast majority of uroliths (>95%) submitted for analysis are removed from the lower urinary tract (Osborne & Fletcher, 1995) [8]. Hypercalciuria, rather than hyperoxaluria, may be a predisposing factor of calcium oxalate urolith formation . Persistent aciduria may be associated with low-grade metabolic acidosis promotes bone mobilisation of carbonate and phosphorus to buffer hydrogen ions. Simultaneous mobilisation of calcium coupled with inhibition of renal tubular reabsorption of calcium, results in increased urinary excretion of calcium (hypercalciuria) (Tion *et al*., 2015) [10]. Diet is an important factor in the prevention of Calcium Oxalate stones. Canned diets high in fat, phosphorus, magnesium, potassium, chloride, and moisture have been associated with decreased risk of Calcium Oxalate formation (Dejen Tiruneh and Tagesu Abdisa, 2018). Diagnostic imaging techniques like radiography and ultrasonography are sensitive in diagnosis, with abdominal ultrasonography having 90% sensitivity, 98% specificity and 97% accuracy. Radiography is a sensitive test for detection of magnesium ammonium phosphate, calcium oxalate, calcium phosphate, silica and cystine crystals which are radiopaque (Hostutler *et al.,* 2005) [5]. Control of urinary tract infection and change in diet can help in prevention of urolithiasis in dogs and cats (Bartges, 2013) [1]. Following surgical intervention, proper general and dietary management is required to prevent reoccurrence of cystoliths. A general recommendation for prevention of urolithiasis is to increase water consumption to encourage diuresis and reduce time for aggregation and crystallization (Tion *et al.,* 2015) [10].

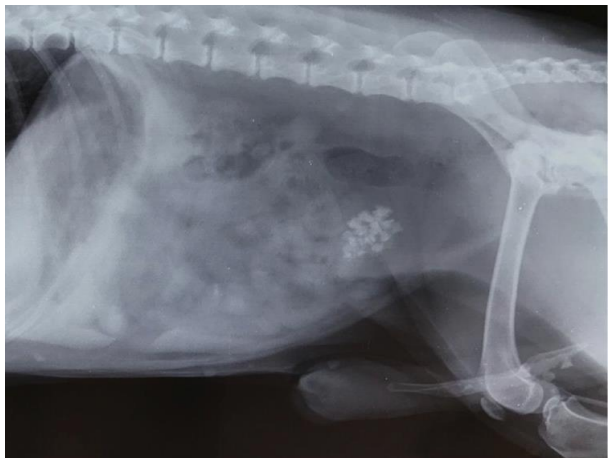

Fig 1: Radiograph showing radioopaque caliculi in urinary bladder and mid ospenis region

Fig 2: Ultrasound image of hyperechoic caliculi in urinary bladder

Fig 3: Bladder with engorged blood vessels

Fig 4: Caliculi removed from the bladder

Fig 5: Post-operative radiograph with no evidence of caliculi

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