

*Original Research***Ultrasonographic Evaluation of Urinary Tract Affections in Dogs****D. Sumathi, P. Ramesh*, M. Chandrasekar, K. G. Tirumurugaan¹ and G. V. Sudhakar Rao²**

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Abstract

Urinary tract infections and urolithiasis are most common urological complications seen in dogs, clinically characterized by hematuria, dysuria or stranguria. Out of 3081 dogs, 385 dogs showed various abnormalities in the urinary tract upon ultrasonographic examination with an incidence of 12.49 per cent during the study period of two years. Highest prevalence was recorded in Labrador retriever (77/385, 20.00%), Spitz (74/385, 19.22%), Non-descriptive (73/385, 18.96%) and Pug (52/385, 13.51%) breeds of dogs. Small sized dog breeds which included Spitz, Pug, Lhasa Apso and Yorkshire Terrier all together contributed to 37.45% of total urological cases. Cystic calculi (47.79%), urinary bladder sediments (16.88%), cystitis (13.76%), urethral calculi (9.61%), urinary bladder mass lesions (6.49%), hydronephrosis (5.19%) and bladder rupture (0.26%) were identified as various lesions in the urinary tract. Present study showed that various urinary tract diseases were more precisely identified using 2D ultrasonography and Colour flow doppler.

Key words: Cystitis, Cystic Calculi, Dogs, Ultrasonography**How to cite:** Devaraj, S., Putchakayala, R., Chandrasekar, M., Tirumurugaan, K., & Rao, G. (2019). Ultrasonographic Evaluation of Urinary Tract Affections in Dogs. International Journal of Livestock Research, 9(10), 133-138. doi: 10.5455/ijlr.20190423094909**Introduction**

Urinary bladder serves as a storage organ for the collection of urine which is excreted by the kidneys and micturition helps in periodical emptying of the bladder. Retention of urine due to any obstructive lesion eventually affects further excretory functions of urinary tract results in the onset of a life-threatening electrolyte disturbances like hypokalemia or hyperkalemia (Klahr, 1987). Urinary tract infections and urolithiasis are most common urological complications seen in dogs clinically characterized by hematuria, dysuria or stranguria. Age, breed, sex, type of food consumed and geographic location of the dog influences

the characteristics of uroliths (Franti *et al.*, 1999). Abdominal ultrasonography is a commonly available, safe and inexpensive imaging diagnostic technique to evaluate structural and positional abnormalities in various internal organs including kidneys and urinary tract (Karpenstein *et al.*, 2011). Superficial location and fluid content in the bladder facilitate the vivid visualization of different structural abnormal lesions like wall thickening, sediments, tumors and stones either in bladder lumen, urethra, ureters and renal pelvis or renal parenchyma (Heng *et al.*, 2012; Lulich and Osborne, 2009).

Prevalence studies on various urological abnormalities, breed, sex and seasonal occurrence in dogs might aid in understanding the disease epidemiology which in turn helps in taking necessary preventive steps. With this background, the study was aimed to evaluate various urological affections in dogs using ultrasonography.

Materials and Methods

Present study was carried out in 3081 dogs referred to the Ultrasonography unit, of a referral hospital during the study period of two years (January 2017 to December 2018). Cases under study were investigated for the 'occurrence of various urinary tract affections as a consequence to the development of azotemia in dogs'. Ultrasonographic examination was carried out with Esaote MyLab 20[®] ultrasound machine using linear and convex probes having frequency ranging from 5-12 MHz. The dogs were positioned either in dorsal or lateral recumbencies to visualize the presence of intraluminal abnormal contents in the bladder and urinary tract after proper patient preparation for ultrasonographic examination.

The various urinary tract affections were diagnosed for based on the following findings: cystitis (bladder wall thickness (>5mm) and inner wall irregularity), bladder sediments (intraluminal echogenic contents without acoustic shadowing), cystoliths, (intraluminal gravity dependent hyperechoic areas with acoustic shadowing) and urinary bladder tumors (space occupying echogenic contents with irregular surface and variable blood supply upon doppler studies and fixed at one spot). Similarly, urethral calculi were assessed based on echogenicity, location, number, size and intensity of hyperechoic areas with acoustic shadowing lesions. Whereas, confirmation of hydronephrosis was done based on the findings of distended renal pelvis associated with prominent ureters containing obstructive hyperechoic areas. Bladder rupture was assessed with the history of dog not voiding urine and corresponding ultrasonographic finding of empty bladder which upon catheterization and saline flushing revealed escape of saline into the abdomen.

Results and Discussion

Three hundred and eighty-five dogs had various affections in the urinary tract with an incidence of 12.49 per cent during the study period upon abdominal ultrasonography. Whereas, occurrence of urinary tract affections was observed higher in summer months than the rest of the seasons (Fig. 1). In the present study the incidence was recorded during hot climate between April to July which corroborated with the reports

of the Fakheri and Goldfarb (2011) who reported that in a study in USA the incidence of urolithiasis is greatest in warmer areas, specifically uric acid and calcium stones and it has been suggested that the incidence and prevalence of urolithiasis are increasing due to climate change. However, this study lacks analysis of uroliths present and also its correlation with climate along with everyday assessment of temperature to figure out if there was an involvement of climatic change. Highest prevalence was recorded in Labrador retriever (20.00%) followed by Spitz (19.12%), Non-descriptive (18.96%), Pug (13.43%) breeds of dogs (Fig. 2).

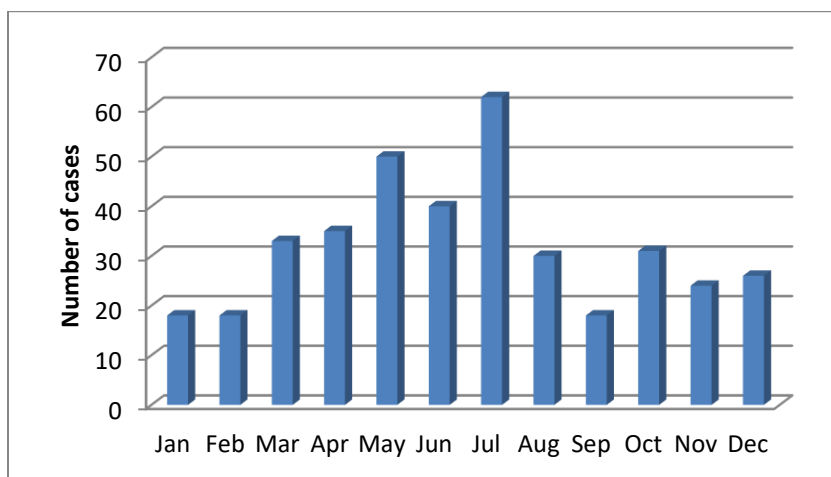


Fig. 1: Month wise prevalence of urinary tract affections in dogs

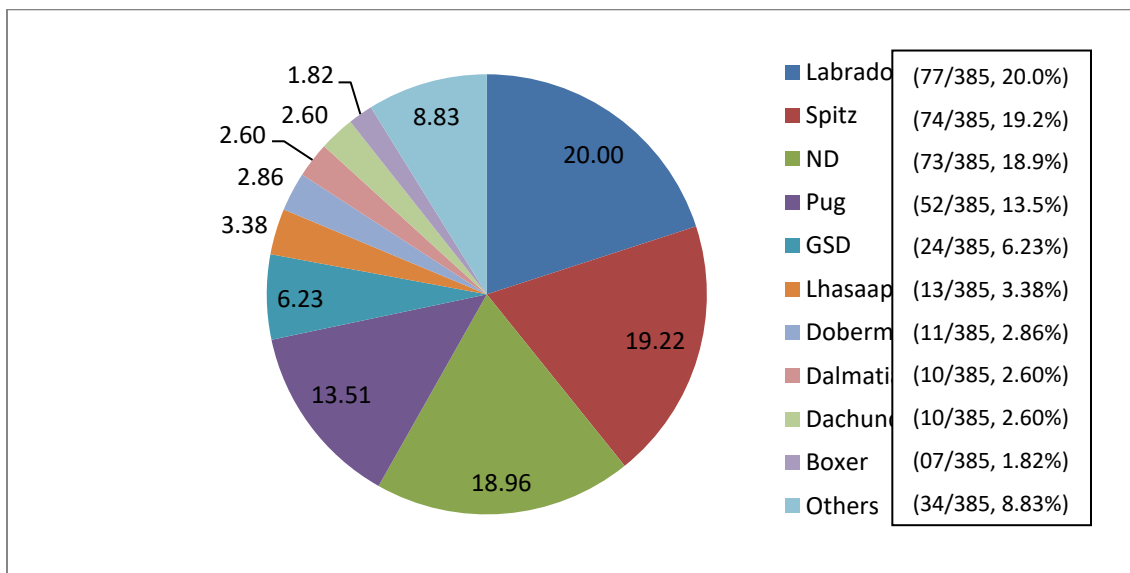


Fig. 2: Breed wise prevalence of urinary tract affections in dogs

The 37.45% of the cases were recorded in small sized dog breeds (Spitz, Pug, Lhasa Apso and Yorkshire terrier). The findings are in accordance with Hunprasit *et al.* (2017), who declared that mean age of dogs

affected with urolithiasis at the time of diagnosis to be 7.2 ± 3.4 years and among them 78.2% of uroliths were observed in seven small breeds like Shih Tzu, Miniature Poodle, Pomeranian, Pug, Yorkshire Terrier and Chihuahua. The male dogs represented more (64.08%) than the female dogs and the mean age affected was 6.59 ± 3.52 years. On contrary, few studies reported incidence of uroliths to be more in female dogs than males (Low *et al.*, 2010; Okafor *et al.*, 2013).

The present study revealed cystic calculi (47.79%) (Fig. 3), urinary bladder sediments (16.88%), cystitis (13.76%), urethral calculi (9.61%, prostatic urethra - 75.67% (Fig. 4) and penile urethra - 24.32%), bladder mass lesions (6.49%) (Fig. 5 and 6), hydronephrosis (5.19%) and a case of bladder rupture (0.26%) were confirmed by ultrasonography (Table 1). Pertaining to the location and number of lesions, out of 184 cystic calculi, single large, multiple and cystic calculi associated with chronic kidney disease (CKD) was observed in 25.0%, 71.2% and 3.8% of cases respectively.



Fig. 3: Hyperechoic area with acoustic shadowing in the bladder

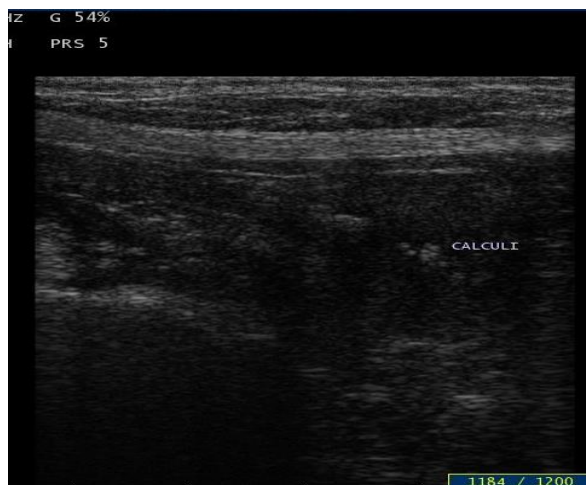


Fig. 4: Hyperechoic area with acoustic shadowing in the prostatic urethra



Fig. 5 & 6: Echogenic mass adhering bladder wall

Table 1: Details of various urinary tract affections identified by ultrasonography

| Condition | Cystic Calculi | UB sediments | Cystitis | Urethral Calculi | UB mass | Hydronephrosis | UB rupture |
|--------------|----------------|--------------|----------|------------------|---------|----------------|------------|
| No. of cases | 184 | 65 | 53 | 37 | 25 | 20 | 1 |
| Per Cent | 47.79 | 16.88 | 13.76 | 9.61 | 6.49 | 5.19 | 0.26 |

Post renal azotemia due to hydronephrosis caused by obstructive urolithiasis was observed in six dogs. Ulrich *et al.* (1996) described the urolith as a aggregation of crystalline and matrix materials that form either in one or more locations within the urinary tract due to over saturation of urine with crystallogenic substances and may contain different mineral compositions, such as various combinations of phosphate, calcium, oxalate, urate, cystine, carbonate and silica (White, 1996). Formation of uroliths may involve multiple physiological and pathological processes (Osborne *et al.*, 1996). These stones may appear single or multiple hyperechoic areas with posterior acoustic shadowing, which move within the bladder lumen according to the position due to gravity during ultrasound examination (Heng *et al.*, 2012; Lulich and Osborne, 2009).

Present study findings are in agreement with the statement of Dehmiwal *et al.* (2015) reported that ultrasonography is a very helpful diagnostic technique to differentiate various conditions of the urinary bladder and kidneys such as cystitis, cystoliths, urethroliths, ureteroliths, nephroliths, renal and urinary bladder neoplasia, where cystoliths appears as a echogenic contents in the lumen adhering to the inner wall of the bladder. Similarly, Temizsoylu *et al.* (2006) evaluated the usefulness of radiography and ultrasonography in the diagnosis of various urological diseases in dogs and stated that ultrasonography had more sensitivity in the diagnosis of upper urinary diseases like pyelonephritis, disorders of renal pelvis, ureters and nephrolith than survey radiographs. The radiography can be used to diagnose the conditions of cystic calculi, but the diagnosis becomes challenging if urinary stones are radiolucent (Larson, 2009).

Conclusion

It was concluded from the present study that cystic calculi, urethral calculi present in prostatic urethra and penile urethra, urinary bladder sediments, bladder mass lesions, cystitis and bladder rupture were more precisely identified using 2D ultrasonography. However, bladder mass was assessed with colour flow doppler to identify blood supply to mass to differentiate it from blood clot. To identify role of climate in urinary tract affections further research is needed and also requires precise analysis of sediments and calculi.

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