

Relationship between residual urine volume and age, gender and weight of the dogs using ultrasound machine

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ABSTRACT

Residual urine volume is a urine volume which is left in the urinary bladder when the act of micturition is completed. It is mostly measured to diagnose different obstructive, neurogenic and congenital disorders of the urinary bladder. Residual urine volume is increased in various obstructive and neurogenic abnormalities of the urinary bladder. In the present study residual urine volume was determined in 24-mongrel dogs using ultrasound machine and its relationship with age, weight and sex was determined statistically by correlation analysis. A significant correlation of bladder volume was found with weight ($P \leq 0.003$) and age ($P \leq 0.006$) of the dogs but there was no significant correlation ($P > 0.01$) with the gender type of the dogs. It was thus concluded from the study that dogs with increase age and weight have high residual urine volumes and these factors should be considered before evaluating the urinary bladder for changes in residual urine volume under various disease conditions.

Key words: Residual urine volume, Sonography, Correlation, dogs.

INTRODUCTION

The small quantity of urine which is left in the urinary bladder after the attempt of urination is called residual urine volume (Bates et al., 2003). It is also referred as residual bladder volume which is measured for the diagnosis of various urination abnormalities (Coombes and Millard, 1994). Bladder volume was found increased in different neurogenic disorders such as intervertebral disc prolapse, spinal cord tumors and encephalitis (Atalan et al., 1999), it is also increased in obstructive and narrowing disorders such as urethral calculi, urethral stricture, prostate hyperplasia, and neoplasms of the urinary tract, and urethral inflammation (Atalan et al., 1998a; Atalan et al., 1998b; Holt, 1990).

The techniques which can be used for the calculation and measurement of the residual urine volume are catheterization (Mainprize and Drutz, 1989), contrast radiography (Timoney, 1989) and ultrasonography (Cardenas et al., 1988) out of which Ultrasonography is considered safe, simple and accurate (Kelly, 2004).

It was hypothesized that residual urine volume is greater in heavy weight and old age dogs. Thus in the present study the residual urine volume was sonographically measured and its association with age, gender and weight was determined statistically by correlation analysis.

MATERIALS AND METHODS

Animals

Twenty four mongrel dogs (16 male and 8 female) of mean age 1.47 ± 0.43 years and weight 19.78 ± 3.5 kg were selected for the experimental study. They were vaccinated and dewormed three days before ultrasound scanning. Health status was checked and their urinary bladders were scanned to preclude the presence of any disease in the urinary bladder i.e. cysts, tumors and cystoliths.

Ultrasonography

Ultrasound scanning was performed with curvilinear transducer 3.5MHz (U.S. Machine, Falco-100). The urinary bladders were scanned three times a day, preferably after the act of urination and mean bladder volumes were calculated for each dog.

The dogs were restrained in dorsal recumbence and the bladders were scanned by placing the probe in caudal abdominal area next to the pubic bone in female dogs and along the side of prepuce in male dogs.

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Scanning was performed in both longitudinal and transverse planes to get the maximum size of the urinary bladder. The length and width along with their depths were measured for each plane by using electronic calipers and the residual urine was measured with the help of formula $L \times W \times \frac{(DL+DT)}{2} \times 0.625$ (Atalan et al., 1998b).

(L= longitudinal diameter, W= transverse diameter, DL= depth at longitudinal diameter, DT= depth at transverse diameter)

Residual urine volume is mostly measured in dogs having the micturition disorders (Oliver, 1987). Catheter studies suggested that the residual urine volume was less than 6ml (Stribrna and Fabian, 1961). In a study it was calculated 0.53ml (0.09-2.34) in the method of administering the E-Coli in to the urinary bladder (Hinman and Cox, 1966). In human study, 30ml of the urine quantity was accepted as an upper limit of residual urine volume (Mainprize and Drutz 1989). The residual urine volume has been reported 12ml in all the tested personals

Table-1. Correlation analysis for weight, age and sex, and mean residual urine volume.

		Weight	Age	Gender
Residual Urine Volume	Pearson Correlation	0.573	0.542	-0.214
	Sig. (2-tailed)	0.003**	0.006**	0.316
	N	24	24	24

**Correlation is significant at the 0.01 level (2-tailed).

Statistical analysis

The relationship between the residual urine volume and age, gender and weight was determined by the statistical technique of correlation analysis (Petrie and Watson, 2006).

RESULTS AND DISCUSSION

Twenty four mongrel dogs were selected for the study out of which 16 were male dogs and 8 were female dogs. Their mean age and weight were 1.47 ± 0.43 years and 19.78 ± 3.50 kg respectively. The mean residual urine volume calculated was 8.15 ± 6.66 ml and the range of bladder volume calculated was 0.09ml-0.63ml/kg (Average 0.36ml/kg and median value-5.5ml/kg). The correlation was significant ($P \leq 0.003$) between residual urine volume and weight which indicated that with increase in body weight, the bladder volume is increased. The correlation was also significant ($P \leq 0.006$) with the age of the dogs which indicated that the bladder volume increases with the increase in age. The correlation was nonsignificant with the sex of the dogs which means that gender type has no effect in the alteration of the residual urine volume (Table-1).

(Di-Mare et al., 1966). Oliver and Osborne 1977 suggested that residual urine volume more than 5ml is abnormal and should be managed medically.

Increase residual urine volume was calculated in various neurological and obstructive disorders i.e. inter-vertebral disc prolapse, neoplasia of the spinal cord, uretholiths and prostatic hyperplasia (Atalan et al., 1999; Atalan et al., 1998a; Atalan et al., 1998b; Holt, 1990). An increased quantity of residual urine volume i.e. 10-20ml or more may predispose to cystitis, vesico-ureteral reflux pyelonephritis and uremia (Bush, 1991; Oliver and Osborne, 1977). Canine bladder volume have been calculated sonographically by linear and two dimensional ultrasonographic measurements which measures the normal residual urine volume range of 0.2-3.5ml/kg (Median 1.8 ml/kg) (Atalan et al., 1998a; Atalan et al., 1998b). A significant relationship between age and weight, and residual urine volume before urination has been reported (Atalan et al., 1999).

In the present study the residual bladder volume was calculated sonographically by two dimensional cross sectional measurements of the urinary bladder. The residual urine volume calculated in this study was 0.09-0.63ml/kg (Average value

0.36ml/kg). Highest values were recorded with increasing weight and age of the dogs. The median 5.53ml/kg is higher than the calculated value of Atalan et al., (1999) i.e. 1.8ml/kg and there was a significant ($P \leq 0.006$) correlation between the age and the residual bladder volume. Also weight and the residual bladder volume ($P \leq 0.003$) was recorded which means that the residual urine volume is slightly increased with increase of weight and age of the body.

CONCLUSION

It was thus concluded that the residual bladder volume is increased with the increase in age and weight of the dogs. Therefore these factors (age and weight) should be considered before evaluating the dog for alterations in the bladder volume in certain diseases. However the gender type has no effect upon the residual urine volume.

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